WHO CHRONICLE

VOL. 14, No. 10 - OCTOBER 1960

379 *Public health education and radiation hazards*

384 *Community water supplies in the Mediterranean area*

387 *International medical research*

390 *Milk and malnutrition*

394 *Health in Africa*

400 *Feeding preferences of mosquitos*

403 *Expert Committee on Tuberculosis*

407 *Infant mortality*

409 *Notes and news*

413 *People and places*

WORLD HEALTH ORGANIZATION

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature which are not mentioned. Proprietary names are distinguished by initial capital letters.

PRINTED IN SWITZERLAND

PUBLIC HEALTH EDUCATION AND RADIATION HAZARDS

Dr M. G. Candau, Director-General of WHO, gave an address on public health education in relation to atomic energy and radiation hazards at a meeting held by the Royal Society of Health in London on 4 April 1960. The text of this address is reproduced by permission of the Royal Society of Health from their Journal (1960, **80**, 3).

There exists today in many countries a remarkable interest in health questions related to ionizing radiation. And in the face of modern developments this concern is easily understandable. Radiation, radioactivity and atomic energy present a very great and rapidly growing challenge in public health.

What is often not realized, however, is that more is known today about ionizing radiation than about almost any other important environmental or industrial hazard. A great deal of experience and information on the effects of radiation on human beings has been accumulated. X-rays and radium have been used in medicine since the turn of the century; and a great deal has been learned from other sources, such as through the unfortunate early experiences with radium in the luminizing industry.

Birth of atomic energy

Against this background of knowledge, deepened by research in radiobiology and the metabolism of natural and accelerator-produced radionuclides, atomic energy was born some 18 years ago. From the health point of view, the birth of the atomic energy industry was unique, because from the very beginning there existed a realistic appreciation of the very great potential health hazards which would accompany it. It was realized that large amounts of radiation would be involved, that new types of radioactive elements would be produced and, more important, that the creation of vast quantities of radioactivity would be associated with uranium fission on a large scale. There was an awareness that exceedingly great precautions would have to be taken for health protection.

The new atomic energy developments stimulated a marked intensification of studies on the biological effects of radiation and the behaviour of radioactive materials in the environment and in the body. And so over the years we have built up a relatively substantial understanding of radiation health problems.

Even in the realm of a very low level irradiation, where our knowledge is most meagre, we are not at a complete loss. We know that since the beginning of his life on this planet man has been bathed in cosmic radiation and exposed to the gamma rays from natural radioactivity in the earth's crust; he has been inhaling the natural radioactivity of the atmosphere, and been bombarded by the alpha and beta particles and gamma radiation from the radioactive elements of his own body tissues. We know something about the intensity and nature of this natural radiation and its fluctuations. And this provides us with a valuable yardstick with which to compare our newer man-made sources of radiation exposure.

We are keenly aware of our need for much more complete and fundamental knowledge in this field. That we can in fact evaluate and take into account radiation hazards more adequately than we can many others connected with modern life is an indication not of any truly deep understanding of radiation but of our ignorance in regard to other everyday industrial and environmental hazards.

Widespread use of radiation

If the radiation problem with which we are concerned stemmed simply from atomic energy activities, the matter would not be so

difficult. Actually, the public health concern is very much wider. While it includes atomic energy, it is related more generally to the widespread, diffuse and rapidly expanding use of X-rays, radioactive material and other sources of ionizing radiation in all sorts of activities—in agriculture, mining, atomic energy, industry, medicine, colleges and universities and various other enterprises both large and small. The use of radiation and radioactivity is part of everyday life in many countries and is becoming more so all the time.

Because the problems are varied, many different disciplines are involved. The disposal of radioactive waste from laboratories, hospitals, industries and atomic energy installations clearly involves sanitary engineering. Accidents in industrial and atomic energy installations or in the transport of radioactive materials may provide urgent and very complex public health problems, calling for assistance from many groups of workers.

Economically valuable uses of radioactivity cannot be safely introduced or exploited in any country unless there is sound preparation of health safeguards, and unless the public health authorities and personnel have the awareness, competence and preparation to fulfil their responsibilities in both routine and emergency situations. The same is true for atomic energy developments. It has become necessary today for physicians, public health officers, nurses, sanitary engineers, health educationists, industrial hygienists and other groups concerned with health to know much more about radioactivity, ionizing radiation and atomic energy.

Public health education

How is public health education and training in this field best handled? Surely no single way is adequate. One of the most characteristic features of radiation health is the degree to which the physical and biological sciences must together be brought to bear on the questions involved. This interdisciplinary nature of the field presents special difficulties in connexion with training.

The person broadly competent in radiation health must be soundly based in physics, biology, chemistry and medicine. It is unrealistic at the moment to ask for large numbers of such individuals in any country. Access to such competence, however, is necessary. The bulk of radiation health work in practice is carried out by persons from different training backgrounds. This is an area characterized by close co-operation and team work between physicians, engineers and physicists. It is a composite field, made up of many approaches and activities, dealing with a wide spectrum of problems. A very real structure and unity does exist, however, and nowhere is this more clear than in public health.

The educational roots lie far back in the undergraduate curriculum, where scientific foundations are laid and where any artificial division between the physical sciences and biology must be bridged. Radiation medicine and radiation pathology should be taken fully into account during the course of professional training in any modern medical school and the graduating doctor should have a basic understanding of these questions.

Special training is required at the postgraduate level. It is here that both the details and the broad public health view must be developed. Here radiation health takes real form as its various aspects fall into perspective.

One of the constantly recurring complaints about the medical curriculum is that it is overcrowded and lacking in coherence. The enormous increase during the past generation in the subject matter of scientific medicine has raised issues which are difficult to solve. In the undergraduate curriculum, there is a potential danger that the introduction of too many subjects will lead the student into acquiring a mere smattering of knowledge without any depth or real understanding.

The selection of subjects is increasingly difficult, because each expert teacher is naturally anxious to secure as much time as possible to present his own material, and is not inclined to show any great solicitude for his colleagues who are equally anxious to push their own subjects. Yet this knot must somehow be untied and a compromise

reached. What are the principles on which we should progress towards this aim?

The first point is that new knowledge, which is of importance to the health of people in the future and can be effectively applied to prevent risks, must somehow receive priority. In many academic institutions, the undergraduate curriculum is admittedly overcrowded with detail; but it is not enough simply to meet these difficulties by reducing the quantity of facts poured into the student from all sides.

The second point is that it would be no solution merely to withdraw the teaching of the basic sciences and introduce a whole series of disconnected bedtime stories about antibiotics, cardiac surgery or the hazards of radiation. One of the essential requirements is to link every subject of vital importance with one at least of the fundamental sciences. In other words, teaching must be structurally connected, so that each subject has a foundation on which it can stand.

Two special courses

The World Health Organization has given specific attention to the question of training in radiation health. I would like to refer here especially to two studies of expert committees in the education field: one [1] dealt with postgraduate training in the public health aspects of nuclear energy; and the other [2] examined the introduction of radiation medicine into the undergraduate curriculum. It would be logical to take the basic undergraduate course first.

As we become increasingly aware of the load already placed on the shoulders of the undergraduate student in medicine, nursing and the allied professions, we can find a place for the new knowledge only by some revision of the existing curricula; and in each case we must ask ourselves what will have a real value for the student in later professional life. To take as an example the medical course, on what matters of public concern and anxiety will the family doctor be expected to give advice and establish confidence? It is clear that in the preliminary period of education, some further emphasis must be laid on the concepts of fundamental science. Basic physics at this stage is a rich source for illustration, and, as the Expert Committee pointed out:

"The recent advances in nuclear physics are among the most revolutionary developments in thought that have been experienced by our generation, and a general acquaintance with them must therefore form an essential part of the education of every cultured person."

The Expert Committee prepared a brief schedule of topics recommended to be included in a pre-clinical course in physics. I lay some stress on this because, with minor variations, it would apply to training for other professional workers in the health field, especially when reinforced by practical illustrations suited to the individual professions such as nursing or sanitary engineering. The principal items are:

(i) the nature of radiations, and their relation to the structure of matter;

(ii) physical, chemical and biological effects of radiations, with particular reference to their technical applications in medicine and their injurious effects on somatic and germ cells;

(iii) detection and measurement of radiation; instruments and units;

(iv) natural sources of radiation (internal and external);

(v) artificial sources of radiation—apparatus for the emission of ionizing radiation, and radioactive isotopes;

(vi) chemical properties of some elements with important radioactive isotopes, such as germanium, rubidium, strontium, xenon and caesium, whose stable isotopes are unfamiliar in biochemistry;

(vii) the principal applications of radiations in biology and medicine;

(viii) the more important radiation hazards, aspects of protection and prevention.

When training passes into the more strictly professional phase, a progressive deviation in the material of teaching may take

[1] *Wld Hlth Org. techn. Rep. Ser.*, 1958, **154**
[2] *Wld Hlth Org. techn. Rep. Ser.*, 1958, **155**

place. Some subjects are of such universal importance to an understanding of the problem that they should be dealt with specifically. The most important of these are genetics, radiation physiology and relevant aspects of biochemistry.

It is not for me to go into the clinical period in the teaching of medicine or nursing, or the corresponding advanced training of the sanitary engineer. Enough to say that both the personal and the genetic risks of radiation must be emphasized, and that a sound practical knowledge of protective measures must be fully understood. The essential point is that the members of the health team will be asked questions by a public brought up on the fodder provided by the daily newspapers, television and cinema. What is more, the student must be taught by illustrations which will enable him to " go one better " than the lay press in meeting public needs and allaying unnecessary fears. If his own teaching is skilfully reinforced by visual aids, experiments and visits to actual installations, he will be well equipped to speak with authority.

We ought not to underestimate the critical force of public opinion, even in an age which takes so many of its emotions in a kind of two-dimensional way. When it comes to a crisis, the ignorant will be found out, and the people will follow the lead of knowledge.

When we come to the post-graduate period, the problem of training is in some respects simpler. Before very long all students who have passed through professional training in the field of health will have acquired some general knowledge of radiobiology. In all branches of public health study they will be equipped to handle the more strictly public health challenge of radiation.

Four instructional levels

In post-graduate teaching the Expert Committee recognized four instructional levels. At each level they considered the subjects under five main headings: physical principles; biological principles; applications of radiation, radioisotopes and nuclear energy; hazards; and protection. It would be well worth while for those who are concerned with planning courses to examine these four levels, as they can be applied to staff members of a health department who have difficult responsibilities and different backgrounds of experience.

At the first level there would be an *orientation course*, suitable as a basic course for all types of health personnel who do not necessarily have specific duties to perform in regard to radiation. It would consist of about six to eight lectures, linked as far as possible with other teaching subjects. Emphasis would be laid on the practical aspects of hazards and protection. This course would be designed for industrial and general nurses; hospital administrators; health educators; and sanitarians.

At the second level an *introductory course* would be appropriate as a basic curriculum for industrial medical officers, sanitary engineers and inspectors, and biostatisticians; and as a further course for medical and veterinary officers who were not expected to have any special responsibility in radiation. It might occupy about 60 hours if given during full-time graduate studies, or two weeks if designed as a special concentrated course. In addition to lectures, opportunity would be given for group discussions and practical exercises. Instruments and equipment would be shown, as well as specially designed films.

The *advanced course* would be designed for medical officers with a definite responsibility in radiation and atomic energy activities; industrial and sanitary engineers; physicists in the health and hospital services; and biostatisticians. The duration would be approximately 120 hours if given during regular graduate studies or four weeks as a special concentrated class. Both academic and practical work would be included, and arrangements made for field visits.

The *specialist course* is much more high powered and is intended for persons with professional backgrounds in science, engineering or medicine who will have special responsibilities in the radiation field or atomic energy. The Expert Committee did not recommend a specific duration for the

course, but it clearly had in mind at least an academic year of full-time graduate studies. A specialist course of this kind would be quite unsuitable for short-term concentration.

Special needs

Another feature of the specialist course is that it might have to be planned on a more or less individual basis to meet the special needs of restricted groups. Some of these would undoubtedly have to concentrate on experimental work in their own spheres, and both laboratory work and practical training would have to be arranged accordingly.

It should be borne in mind that post-graduate training cannot be considered in isolation from either undergraduate training or the general education of the public. All the members of the staff of a public health department are likely to have to deal with *some* aspect of radiation or nuclear energy. Public health workers will also be responsible in varying degrees for making recommendations to their authorities on the health and safety aspects of ionizing radiation and radioactivity.

The health officer will be responsible for assessing the effects of radiation exposure on the general population not directly concerned with handling and using radioactive materials. He may well be the first source of information and advice on the health and safety of workers engaged in work connected with radiation. Secondly, the health officer will be called upon to advise on the safe use of radiation, including X-rays for both diagnosis and treatment, and in its use in industry. The sanitary engineer will also be concerned with levels of radioactivity encountered in the environment. Other members of the public health team will be charged with the duty of public information and, it may be, soothing the apprehensive and over-excited.

For all these purposes, it is essential that the post-graduate training of the public health officer should provide information on which he can teach and act, and deal with emergencies. He must be an authority on all the community implications of atomic energy, and no less on the negative aspects, such as protection of hospital staffs, of industrial workers, and of the community as a whole in the event of local accidents or major catastrophes.

In view of all these considerations, the comprehensive training of the health officer and the potential members of his team becomes of outstanding importance. The principal members of this team are the medical officer of health, the public health nurse, the sanitary engineer and colleagues in environmental sanitation. This does not cover the list of those who require training in radiation health; one immediately thinks of industrial hygiene workers, veterinary public health officers, and laboratory and other technical personnel. There are many other grades of health workers who have important duties in this connexion. One should make special reference to those whose function it is to educate public opinion, to provide authentic knowledge and at the same time help to dispel irrational anxieties. This is not merely a technical function, but a problem of supporting moral and spiritual strength.

Conclusion

In this short paper, I have tried simply to do two things, and much of the detail of teaching in radiobiology has had perforce to be omitted. First, I have attempted to give some indication of the constantly enlarging interests of the World Health Organization in the entire sphere of radiation and the health aspects of atomic energy. I have also tried to make it clear that my subject has been limited to the health aspects of teaching and practice, without attempting to range widely over the general field. In the second place, I have tried to show the essentials of a series of teaching programmes recommended by our experts. Their work is very recent and their standing, both in public health and in the medical aspects of radiation and atomic energy, is very high indeed.

We in the World Health Organization rely a great deal upon the system of bringing together, for a period of perhaps a week or ten days, groups of experts in specific subjects.

We make special efforts to get their advice on the subjects of tomorrow rather than the findings of yesterday. I know well that you all realize the great and urgent importance of studies of this kind, and the need for all members of the public health profession to be kept thoroughly informed on pertinent developments in the rapidly moving health sciences. It is only in this way that they can win confidence and prevent complacency on the one hand, and the equally dangerous panic on the other.

The whole situation has been summed up very well by Shakespeare with his usual masterly touch:

If it be now, 'tis not to come ; if it be not to come, it will be now . . . the readiness is all. (Hamlet, V. ii. 232)

COMMUNITY WATER SUPPLIES IN THE MEDITERRANEAN AREA

In 1959 the Twelfth World Health Assembly discussed a report by the Director-General [1] in which he advanced the thesis that WHO had dispersed its efforts in environmental sanitation over too wide a front, and should in future concentrate on a more limited objective. A satisfactory programme with such an objective should fulfil all or most of a number of criteria: it should be of ready appeal; give a reasonable expectation of being easily and promptly carried out; exact the minimum amount of time and energy; confer the greatest possible advantages in terms of public health, comfort, and economic return; require little health education; and need little or no research. What environmental sanitation programmes best met these criteria? Only community water supplies and community sewerage, and of these the former had the more dramatic and universal appeal.

The Assembly endorsed the Director-General's views, and urged that priority be given in national programmes to the provision of safe and adequate domestic water supplies. WHO opened a special fund to assist governments in developing community water supplies and to co-ordinate the work throughout the world by providing the technical and advisory services required and collaborating with whatever agencies were interested.

In December 1959 WHO sponsored a seminar on community water supply in the Mediterranean area,[2] attended by representatives of various governments, of the US International Co-operation Administration (ICA), and of the International Water Supply Association (IWSA). Its aim was to examine the latest information on the organization, financing, management and control of community water supplies, and to exchange views on methods of stimulating the construction of new systems and the improvement of existing ones. The seminar, as the WHO Regional Director for the European Region remarked in the opening address, was the first practical manifestation of the World Health Assembly's desire for action to provide community water supplies, and had arisen from the request of the Regional Committee for Europe for stimulus and leadership in this field. The Committee had recognized that, while the majority of the cities in the Region are now provided with adequate and safe supplies of water, considerable numbers of smaller communities still do not have them. Supplementary sources of water should be developed, therefore, but existing sources also need to be extended as well as maintained and operated with care; for, as urbanization and industrialization develop, water is being consumed in increasing quantities, and there is at the same time greater danger that sources will be polluted.

Even if its use in industry is excluded, the daily consumption of water in the modern community is several hundred litres per head (as compared with only a few litres per head in a primitive community) and the effects on the social, economic, and health conditions of the people are incalculable. There is a great

[1] See *WHO Chronicle*, 1959, 13, 309.

[2] This article is based on the seminar's report (unpublished document MHO/PA/39.60).

saving of time if water is freely available: the time of mothers, who can concentrate on better home and child care; and of fathers, who can increase their working capacity and produce and earn more. Besides its use for personal and domestic cleanliness, water has a marked influence on other aspects of public health. In California, for example, it was found in 1952-1953 that the extent to which water was available bore a direct relationship to the incidence of *Shigella* infection in migrant workers. This finding was confirmed in Brazil in 1956, where it appeared as well that mortality from diarrhoea in infants under 4 months of age was 60-70% among families who had to fetch their water from unprotected wells or public faucets, whereas among families who had water laid on in the house it was only 20%.

There is no quick and easy way of providing a community with adequate and safe water supplies; hard work will be needed. Conflicts of interest will occur between ministries and departments; legal and organizational readjustments will provide stumbling-blocks throughout the complicated administrative, financial, and managerial operations involved; personnel problems will be acute. It will be necessary to break down the tradition of free water in many places, a tradition that dates back to before the days of aqueducts, pumps or purification works. It must be replaced by the realization that when public water supplies are developed and made safe they cost money, and that operation and maintenance also cost money. This money must come from somewhere. According to one participant in the seminar there is more available, even in the less developed countries, than is generally thought. The scarcity of adequate water supplies is not always due to poverty, but often to inertia, neglect, lack of understanding of the way to go about providing them, failure to appreciate the theory and practice of self-liquidating investments and other aspects of public finance, or even a disposition to spend available funds on other perhaps less worthy projects. Money is often being spent wastefully on providing water, and could be spent more profitably if the officials concerned were shown how.

Another participant stressed the need for hastening slowly. In Amsterdam (he said) the water supply before 1850 depended on public and private wells and on water brought by boat from a distant river. In 1851 a piped supply was installed by a private company, and most households got their water from stand pipes and paid per pail. Gradually the piped supply was introduced into houses, and by the end of the century almost all houses had it; and the average daily consumption per head—at first not more than 20 litres—slowly rose with the introduction of modern appliances. In his view the path followed elsewhere should be the same one. People would have to become familiar with the new way of living. If the system grew too fast the financial consequences would prove too heavy a burden on the community. This participant then worked out the running costs for a community of 100 000 starting with a daily consumption of 20 litres per head and reaching 100 litres in 50 years and 200-400 in 100 years. For a family of four, consuming 20 litres in the initial years and then 50 litres, the daily expenditure would be 1½ and then 2½ US cents per head: not an excessive amount for a primary need.

The seminar discussed a large number of subjects of vital importance in any programme of community water supplies: the organization of national programmes; the estimation of capital requirements; methods of financing; the early steps to be taken in implementing a national programme; the establishment of equitable and adequate water rates; the relative functions of public health and public works agencies; the considerations involved in establishing minimum design criteria; the control of the quality of water; systems of waterworks operation and management; and education and training in connexion with the community water supply programme. The role of WHO and other international agencies in the national programmes was outlined; and an ICA representative spoke about ICA plans and activities.

The discussions of the seminar did not stop at generalities, but went into details. On the controversial subject of water rates, for

example, there was a discussion on the overall objectives of these rates (the provision of sufficient revenue for the operation, maintenance, development and perpetuation of the water supply, the promotion of rational economic water consumption and the prevention of wastage, and the just allocation of charges between consumers and property owners); on the metering of domestic supplies; on sliding and reverse sliding scales; on the calculation of gross revenue requirements; and on the allocation of charges in the collection of the rates. The discussion on control of the quality of water ranged over criteria for judging sanitary quality, exploratory surveys, the analysis of the water, ground and surface waters, water supply systems using treated and untreated water, disinfection, clarification and adjustment of the chemical properties of the water, limit concentrations, and the expression of results.

The seminar had no doubt that community water supplies would benefit the economic and social conditions as well as the health of a community. They would lead to an improvement of the worker's health and so to increased productivity, reduce industrial absenteeism, and by preventing disease help reduce the weight of taxation required to support medical services. They would give greater leisure, and impart the personal pride and self-respect afforded by clean bodies and a clean home. One participant suggested indeed that once the women in the country from which he came were relieved of the burden of carrying water their status and dignity would be enormously increased, for donkeys and women did all the carrying and there was a tendency to place them in the same category. Another suggestion was that the changed pattern of life might lead to some mental stress, but this was accepted as a purely temporary phenomenon, if it occurs at all. The mental health aspect, it was agreed, is of great importance, but little is known about it and it deserves study by health educators, mental health workers, and sociologists. One feature of it is psychological resistance to the installation of water in the home. It is generally thought that the benefits of water supplies are so self-evident that people will welcome them into the home with joy. This is normally, but not invariably, true; in some areas there is a superstitious objection to water under pressure.

There was unanimous agreement that a national water supply programme should be administered by a single well-organized national agency. This agency would *inter alia* control water resources to ensure their rational use and, if necessary, allocate water to communities; look after the development of water resources in communities; plan and study financing methods; implement plans in the early stages; assist in setting up managing boards in the communities; devise and administer a national plan; and perhaps even arrange the financing and carry out part of the plan according to local conditions.

An accurate estimate of the cost of a project is of vital importance to its financing and therefore to its acceptance by a community. Many factors enter into this estimate, some of which are not fully appreciated. They include preliminary surveys by engineers and other specialists; the cost of the land for the reservoir, buildings, etc.; rights-of-way and legal costs appertaining thereto; the cost of raising capital; interest on borrowed money; the actual construction cost; fees for the consulting engineers and other specialists; the operating costs until the scheme begins to earn revenue; and the inevitable miscellaneous expenditure. In planning the undertaking it must be constantly kept in mind that it should be a self-liquidating investment.

The health authorities should be required to review and approve plans for water supplies. There should also be the maximum collaboration with other governmental agencies involved, and here a national advisory committee might be useful, both to associate representatives of these agencies with the work and to procure the advice of influential members of the public.

The provision and design of a waterworks depend on a number of considerations. Among these are the availability of money; the economic circumstances of the community; the question whether the project can be accomplished in stages so that the expenditure is spread over a prolonged period;

simplicity (unnecessary automatic devices might be eliminated); ease of operation; the standard of skilled and unskilled labour; the quality of the materials; the availability of equipment and spare parts; the anticipated growth of the area; the possible future demand for water; and the social conditions, customs and traditions of the area.

An immense educational effort is needed to persuade all the interests involved that it is to their advantage to co-operate in the provision of community water supplies. The financial interests must be induced to invest, on the ground that an adequate water supply will improve the community's health, prevent drift away from the community, attract industry, and make agriculture more prosperous. They must be shown that the investment is secure and offers a reasonable rate of return, and that the debt will be satisfactorily extinguished in due course. One suggested approach would be to prepare a list of waterworks in each country that are successfully operating as self-liquidating investments. A guarantee by governments that loans would be repaid would be an enormous attraction to investors. The co-operation of interested international agencies should also be sought: of the UN, FAO, ILO, UNESCO, the World Bank, ICA, and others. Finally, those countries that have expressed an interest in granting commercial and manufacturing assistance to foreign countries should be encouraged to help, on the ground that they would gain credit for humanitarian motives, acquire prestige, benefit mankind, and at the same time receive an adequate return for their investments. But each country should start work on community water supplies without relying on WHO or other agencies. It should furnish a practical demonstration of what can be done, and the effect will perhaps result in a spirit of emulation that will lead to an extension of the programme.

INTERNATIONAL MEDICAL RESEARCH

In a paper presented to the American Public Health Association [1] on problems in developing international health programmes, Dr M. G. Candau, Director-General, World Health Organization, discussed research. "Research", he said, " is becoming one of the most important activities of WHO and this provides many further examples of the dynamic nature of the organization's programs. The original constitutional mandate given to WHO included the promotion and stimulation of medical research but, in the practical day-to-day work of the first years, the importance of research was to some extent obscured. Faced with serious financial limitations, WHO's effort concentrated on helping governments to control the major communicable diseases. Paradoxically, every step forward in the fight against these major communicable diseases revealed gaps in knowledge as well as deficiencies in the methods and technics used against them. It became increasingly evident that research was the only means of overcoming these shortcomings which threatened to jeopardize every campaign however well conceived and carried out.

" By the end of the first decade of WHO's work, the indications were that progress in world health in the coming decade would depend to a great extent on our ability to develop to the fullest the resources remaining unexploited in the world for the promotion of medical research. It is to the credit of the United States Delegation at the Eleventh World Health Assembly in Minneapolis... that the question of WHO's responsibility in this field was raised openly, and thanks to the unanimous stand taken by the Assembly we have now a blueprint defining the areas in which WHO can and should develop an intensified research program.

" Here I should like to reiterate that we con-

[1] Candau, M. G. (1960) *Amer. J. publ. Hlth*, 50, No. 6, Suppl., p. 3. The extract from the paper is quoted by kind permission of the *American Journal of Public Health*.

tinue to believe that research is and should remain a predominantly national responsibility, and that it is the individual research worker who is at the heart of every scientific investigation. It follows that successful research depends upon the freedom of the individual research worker to develop his own potential and his ideas. As in the past, WHO will refrain from undertaking research on its own or any action which might lead to duplication or overlapping.

"Our primary purpose is to bring together the various research activities going on in many countries. The need for coordination has become more pressing because of the accelerated speed and enlarged scope research has acquired in a few countries, as in the United States, for example. We hope that the communications we shall establish between research workers of the world will reveal the gaps and single out the shortcomings and limitations of present-day research when it is examined from a global viewpoint; that it will stimulate the formation of potential nuclei of research which until now could not be developed because of lack of manpower, or of money, or both.

"As we see it, the fields of research where WHO can usefully play a part fall into a few broad categories. There are, first, the problems which can only be examined on a world level, such as demographic studies and statistical data on the prevalence of diseases, old and new, throughout the world. The second category includes communicable diseases which are either of a world-wide character or so widely spread over several regions that they would yield only to a co-operative effort. Virus diseases and tuberculosis fall into the first group, while malaria is characteristic of the second.

"Another group of diseases, logically suited for internationally co-ordinated research, are those which present unexplained variations both in incidence and prevalence according to geographic, economic, and social conditions. The comparative study of such diseases —and I would mention cancer, rheumatism, cardiovascular disease, diabetes—may very well provide us with a clue to the general causes of these diseases.

"Sometimes the investigation of a very rare affliction in a remote spot of the globe may be of interest to all countries. Thus the study of pulmonary hypertension as reported in the Andes among people living above 12 000 feet might explain the mechanism of pulmonary hypertension in general.

"Lastly, international assistance in the form of training, money, or other facilities may enable countries to develop a research potential that has not been fully exploited because of lack of resources.

"In intensifying its research programs, WHO will by and large employ the same means as have been used in other branches of its work. There is first the training of research workers at all levels, from the junior research student to the scholar who receives specialized supplementary training in some new skill.

"Then there is the method that can be qualified as 'servicing research'. This encompasses a variety of activities to enable research workers to communicate their knowledge to each other. Unless nomenclature, definitions of disease, technics, and material are standardized, there is a risk that important research will remain of only local or arbitrary significance, or even lead to frustrating and harmful misconceptions."

What kinds of problems in research face WHO? In 1959 the Twelfth World Health Assembly established an Advisory Committee on Medical Research. This Committee met for the second time in June 1960 and reviewed a series of reports, papers, and programme proposals on research in the following subjects.

Treponematoses

Interest in the field of treponematosis research, the Committee agreed, has declined since the introduction of effective antibiotic treatment. Nevertheless, most of the fundamental problems remain unsolved. Pathogenic treponemes have not been cultivated—and until they are it will be difficult to determine when resistance to antibiotics emerges. Antigenic studies are rudimentary. Diagnostic serological tests are largely empirical. At the same time the picture of endemic treponematosis is changing : yaws is

disappearing, and with its disappearance syphilis may spread. Little is known about the epidemiology of endemic treponematoses.

What could be done about this situation? Interest in basic research should be encouraged. Reference and supporting services should be assisted and developed. Epidemiological and field studies should be promoted. And techniques applicable in public health control and eradication programmes should be developed.

Tuberculosis

WHO's main concern is with the control of tuberculosis in populations. A suitable research project from this point of view is a trial of BCG vaccine in a population containing a large percentage of persons with a low degree of tuberculin sensitivity. Another is a comparison, in a country where BCG vaccine is given orally, between the effects of the vaccine as given by this method and as given intradermally. The Committee thought that the inclusion of a non-vaccinated group in the latter project is not justified.

Malaria

Although efficient drugs are available for individual use under good conditions, drugs are needed that will be effective when given to large groups under other conditions and for shorter times. Another aspect of antimalarials in which research is needed is drug resistance.

The final stages of the eradication of malaria from particular areas now present problems. Research is required into the influence of symptomless carriers and into population movements. Resistance to insecticides and ecological research are topics that need attention. Of the basic studies, that on the influence of haemoglobin types in susceptibility to malaria deserves support.

The Advisory Committee was informed of the discovery that *Plasmodium cynomolgi* var. *bastianelli* has been transmitted by mosquito bite from lower monkeys to man. This means that malaria must now be considered not merely a possible but an actual zoonosis, with implications that are potentially great for research as well as for control.

Immunology

In particular projects, WHO promotes a considerable amount of research into the preparation, use and effectiveness of vaccines. However, attention also has to be given to the broader aspects of immunology. Techniques and methodology need to be standardized to avoid confusing differences of practice arising with the different vaccines. Methods for evaluating different categories of vaccine and adjuvants and the identification and characterization of active antigenic fractions from different organisms require further investigation. The present position in this field resembles that which faced first the League of Nations and then WHO in biological standardization. Starting from particular cases, however, an impressive body of general knowledge with wide theoretical implications has been created. It might be possible to do this with immunology also.

Nutrition

Nutritional factors enter into many branches of medicine, and so nutritionists should be attached to any clinical group investigating, say, microcytic hypochromic anaemia, or aspects of normal development in children, or diseases due to infections or infestations in which undernourishment is thought to play a part. A nutrition research group should keep in close contact with other international agencies—such as the Food and Agriculture Organization—that are particularly concerned with foods and their relative values and availability. One important task would be to investigate alternative sources of food, for example substitutes for milk that could be derived from plants. Yet another would be to direct attention to areas worthy of closer study; an example would be the period of special vulnerability at weaning and in the following few years.

Cardiovascular diseases

Research into coronary artery disease, hypertension, and atherosclerosis is being widely conducted in many countries. WHO has here an important role in bringing

together suitable groups of workers interested in these conditions, who can exchange ideas and provide stimulation towards further research. There should also be meetings of workers in allied fields such as neurohumoral mechanisms; the difference of approach might produce new and valuable ideas. These various meetings should preferably consist of small working parties held in institutions where research is in progress.

The epidemiology, standardization of techniques, and investigation of the cardiomyopathies deserve attention. Most cases occur in tropical countries which unaided could hardly investigate them fully themselves. The creation of a reference centre in the tropics, possibly at Kampala in Uganda, is a suggestion worth pursuing.

Cancer

Research into neoplastic disease in animals would assist the study of human cancer by providing clues to etiology through the establishment of relationships between the prevalences of different tumours and environmental and genetic factors. Veterinary and human pathology laboratories should exchange specimens.

MILK AND MALNUTRITION*

Malnutrition is the cause of many diseases in human beings, but is particularly harmful to young children, pregnant women and nursing mothers. It is one of the principal causes of infant mortality, retarded growth, mental apathy and, later in life, reduced working capacity. The programme for the distribution of dry skim milk, carried out by UNICEF in collaboration with FAO and WHO, is an example of joint international action to improve nutrition in less developed countries.

Since its inception in 1946, UNICEF has devoted 22% of its expenditure to obtaining dry skim milk for supplementary feeding programmes at maternal and child health centres and schools. Technical guidance on the use of the milk in these programmes is given by FAO and WHO.

The three Organizations decided to make a careful survey, with the help of qualified consultants, of the extent to which the distribution of dry skim milk is a satisfactory way of using international and local resources as compared with other measures to improve the diet of mothers and children. The information obtained was also intended to serve as a guide for the future distribution of this product by international agencies. The experts appointed [1] to undertake this mission visited Brazil, Costa Rica, the Philippines, Indonesia and Libya between 31 October 1958 and 26 February 1959.

Of the factors influencing the general health and nutritional condition of mothers and children in the countries visited, the chief are malnutrition, gastro-intestinal disorders, and intestinal parasites. The nutritional condition of pregnant women and nursing mothers, as well as infants and other young children, leaves much to be desired. Protein deficiency is the most frequent and serious nutritional disorder. Although vital and health statistics in most of the countries visited were incomplete, the rates for births (40-50 per 1000 population), general mortality (10-27 per 1000), maternal mortality (1.7-12 per 1000), infant mortality (80-556 per 1000 live births), and mortality among children in the 1-4 years age group (12%-20% and above of all deaths) were high. The principal causes of maternal deaths are haemorrhage, toxaemia and sepsis; of infant deaths, diarrhoea,

* Based on: United Nations Children's Fund (1959) *Dry skim milk distribution*, New York

[1] WHO appointed Dr G. Herlitz, Director of the Children's Clinic, Central Hospital, Linköping, Sweden, and Professor A. Wallgren, Emeritus Professor of Paediatrics, Royal Caroline Medical School, Stockholm, Sweden. FAO appointed Dr A. Vergara, of the FAO Nutrition Division.

bronchopneumonia and malnutrition. The available data on diet indicate that higher milk consumption would greatly increase nutritional standards and thus improve health —particularly in the most vulnerable population groups.

In South-East Asia, milk production is low and milk does not form a part of the normal diet. Nevertheless, the milk distributed by UNICEF and other agencies and that imported commercially have created a demand and a consequent increase in the market for locally produced milk. In the Latin American countries visited some progress is being made in the establishment of dairy industries, but milk production is still far below the desirable level.

International distribution of dry skim milk

The amount of dry skim milk supplied through various channels in 1958 is shown below:

VOLUNTARY AGENCIES	*Kilograms*
US milk	204 600 000
Canadian milk	2 000 000
GOVERNMENT SALES	44 500 000
UNICEF	
US milk	25 500 000
Canadian milk	4 600 000
UNRWA (United Nations Relief and Works Agency)	
US milk	1 300 000
	282 500 000

Of the total amount of dry skim milk distributed in recent years, UNICEF shipped 30% in 1956, 16% in 1957 and 11% in 1958. It has obtained the milk for distribution as follows: at the beginning (1947-1949) it purchased supplies in the USA and Canada at the market price; from 1950 to 1954 it obtained the milk from the USA at a nominal price; and, from then on, the US Government made supplies available free of charge at the US port of exit. In 1958, Canada also began to supply free milk for the programme. UNICEF bears the cost of transporting these supplies to the ports of destination, and the governments concerned are responsible for transport inside their respective countries.

Distribution at maternal and child health centres

As a rule, the dry skim milk distributed at maternal and child health centres is supplied in containers which can be stored for a considerable period without deterioration. When the supply is limited and priorities have to be established, preference is usually given to children in the 1-4 years age group. Priority is accorded on the basis of the general state of health, nutritional condition, economic and social situation, and, in children, rate of growth. The milk is either reconstituted in the centre or distributed in powder form, in which case instructions for use are given to the mothers. As a rule the milk is well accepted. Some cases of diarrhoea occurred among people using it for the first time, but ceased when smaller amounts were given to begin with. The children's weight charts are the best proof of the value of the milk, and comparisons between those receiving and those not receiving it clearly show the advantages of the programme. In addition, the distribution of the milk has increased attendance at the centres and has often led both the mothers and the staff of the centres to take a greater interest in nutrition.

Distribution in schools

More children receive milk in schools than at maternal and child health centres. Nevertheless, it should be remembered that many schools do not take part in the programmes, and that in the less developed countries many school-age children do not attend school. In the countries visited, the percentages of children of school age receiving milk were approximately as follows: Brazil, 10.8%; Costa Rica, 93.7%; Indonesia, 6.6%; Libya, 50%; Philippines, 39.7%. Unfortunately, supervision of the preparation and consumption of the milk in schools is often inadequate; more enthusiasm by the teachers would help. In some of the countries visited the provision of dry skim milk and school meals has clearly helped to improve the health of the children, reduced absenteeism,

and led to a rapid increase in the number of children attending school.

Nutritional, social, administrative and economic aspects

One of the major advances in nutritional science over the past few years has been the recognition of the frequency of protein malnutrition in infants and young children, and of the consequent need to give them more protein-rich foods. Each country should therefore prepare a programme to meet its people's nutritional requirements, either from its own resources or through international trade. As, however, many countries are not in a position to do this in the immediate future, it is urgently necessary—as a transitional measure—for special arrangements to be made to provide them with protein-rich foods.

These foods can at present be obtained only from the surplus stocks of certain countries producing more than they consume or sell abroad at the market price. The principal surplus foods available are dry skim milk and wheat, the former being unquestionably the more valuable for making good a protein deficiency. The main advantages of dry skim milk are as follows: it contains a high percentage of good quality protein and other important nutrients; it is easy to handle, transport and store; it is inexpensive; and it is well accepted.

When fat is removed from milk in the process of skimming, vitamin A is also removed. Since in many under-developed countries the intake of vitamin A is low and since young children there often show signs of rickets (vitamin D deficiency), it is important to add vitamins A and D to the diet of children under 4 years of age. UNICEF has sent fish liver oil capsules containing vitamins A and D to some countries for distribution to persons receiving skim milk. However, since the distribution of these capsules entails additional work, the ideal method would be to supply dry skim milk enriched with the necessary vitamins to countries where children are in evident need of them. Field trials on the practical advantages of enriching dry skim milk with vitamins A and D are currently under study.

There is a danger of contamination when the milk is being reconstituted; to avoid this, the FAO/WHO Joint Expert Committee on Milk Hygiene has made the following recommendations [2]:

"Water used for reconstitution must be bacteriologically safe and free as far as possible from mineral salts. If it is not bacteriologically satisfactory it should be brought to the boil and subsequently cooled to 50° C before use. Mixing of a known weight of the milk powder with the correct volume of warm water should be conducted in scrupulously clean vessels, previously steamed, or sanitized with an appropriate disinfectant solution and rinsed with clean water. Utensils and stirring apparatus used to assist in the mixing, as well as containers in which the reconstituted milk is to be dispensed to customers (e.g., in school feeding schemes) must also be scrupulously clean. The mixing itself should be done by an experienced worker, or under expert supervision. Any staff dealing with reconstitution or subsequent distribution of the liquid product should have a clean bill of health."

Reconstituted milk should be consumed where it is prepared. The advantages of distributing milk in powder form at the maternal and child health centres are that it can reach more people, the cost is less, and the risk of contamination in the centres is reduced. On the other hand, there is the obvious danger of the milk not reaching those for whom it is intended, and also some risk of contamination during preparation in the home. These disadvantages can, however, be reduced by adequate instruction of mothers and by visits of maternal and child health personnel to the homes.

As surplus supplies of dry skim milk are limited, priorities must be established according to needs. Those most in need of supplementary proteins include pregnant women and nursing mothers, infants from the age of 6 months (or from the time of weaning if this takes place earlier), and children in the

[2] *Wld Hlth Org. techn. Rep. Ser.*, 1960, **197**, 23

1-4 years age group. Then come pre-school and school-age children. It should be remembered too that nutritional requirements at the age of puberty are also great. Furthermore, within each group the actual state of nutrition and the economic and social conditions of the family should be taken into account. Vitamins A and D should always be given with skim milk to infants and to other beneficiaries in need of these vitamins.

With regard to the " ration ", WHO and FAO recommend 40 grams a day in all cases, but the local medical authorities should be left free to change the quantity in exceptional circumstances, with WHO's and UNICEF's agreement. The daily issue may sometimes be reduced to 25 grams—e.g., for schoolchildren who receive other protein-rich foods in school meals.

Unlike schoolchildren, very few mothers and infants receive the milk at present. If the nutritional needs of mothers, infants and other young children are to be met, it will be necessary to expand maternal and child health activities by opening new centres and training fresh personnel for them. Milk could also be distributed to pre-school children through kindergartens and other child care institutions, but if so their staff would have to be trained to give it. On the whole, distribution in the countries visited seems to be well organized. A big obstacle to further expansion in some countries is the cost of internal transport and distribution.

If the programme is to function satisfactorily, teachers in the schools and auxiliary personnel at the maternal and child health centres must be trained in the basic facts about nutrition and their practical application so that they can in turn teach the children and mothers. There must also be adequate general administrative supervision. One country has achieved this by appointing 12 full-time supervisors, each with his own district, under the direction of a programme manager.

In countries that have not been milk-drinking in the past, the best plan, in the absence of any alternative protein-rich food, is to continue the distribution of dry skim milk and, if it is not possible to develop the milk industry in a short time, to encourage production of other proteins from local resources.

The economic factor must also be taken into account. The cost of internal distribution may be estimated, on the average, at $ 0.05 per pound and this is high enough to make it impossible for some governments to accept increased quantities of milk. It is difficult to calculate the cost to governments of taking over the whole dry skim milk distribution programme, but it may be said that, given the existing economic situation in most beneficiary countries, they would find great difficulty in assuming this responsibility.

As far as UNICEF is concerned, the cost of transport by sea has an important bearing on the possibility of extending the programme. This item amounted to 2.28 cents per pound in 1958 and it has since risen to 3.10 cents. In 1958 the total cost of transporting dry skim milk by sea was just over $2 000 000.

In considering the future of the international distribution of dry skim milk, it must be remembered that, so far, the whole operation has been made possible by the existence of surplus supplies in the United States and Canada. Apart from the fact that these circumstances may change, no country's protein needs should ever—as a long-term policy—depend upon chance surpluses from other countries. In the first place, these surpluses can never fully meet the needs of the people in the under-developed countries and, secondly, undue reliance on them might prejudice the natural development of these countries' own resources. Consequently, the distribution of dry skim milk must be considered as a temporary expedient only, adopted to meet an urgent need. This being so, the international agencies must provide countries with the necessary assistance and advice to enable them to develop their own resources and thus cover their nutritional requirements without outside aid.

HEALTH IN AFRICA*

I consider it a great advantage to be able to speak to you today about health in Africa and, in particular, in the Region South of the Sahara, where I have spent a great part of my working life. It has been my privilege to witness a vast and rapid improvement in the health conditions of this region, especially during the last 20 years or so. All those who live in tropical Africa today, and who have known conditions in the past, are able to appreciate the extent of the progress made in the field of health during this period. Diseases which at one time were practically insuperable obstacles to the development of that part of the world do, of course, still exist—such as sleeping sickness, malaria, yellow fever, smallpox, yaws, and others—but their importance as public health problems has dwindled in very extensive areas while, in others, they have been completely eradicated.

I know that much remains to be accomplished but, if I lay stress on what already has been achieved, it is because the special, local conditions of tropical Africa are most favourable for diseases to flourish and thus create public health problems which are, generally speaking, much more acute than those of other parts of the world. To illustrate the point, suffice it to say that sleeping sickness as it is found in Africa occurs nowhere else; that malaria there has a very complex epidemiology and is transmitted by the most efficient and dangerous vector found anywhere; that jungle yellow fever also has a most complex epidemiology in Africa; to say nothing of the problems raised by other diseases, like onchocerciasis, for example.

Pliny, referring to what was commonly said in ancient Greece, wrote: "Ex Africa semper aliquid novi," which I freely translate as "Always expect something new from Africa." Time has not dimmed the truth of this verity.

Africa is the land of contrasts. Climatically, it ranges from eternal snow to burning desert heat; two deserts, one in the Northern and the other in the Southern Hemisphere, create the limits of the true tropical zone. Economically, there are still tribes which subsist on hunting and close by, modern life hums in skyscraper cities and atomic reactors already produce energy. Above all, it should be remembered that Africa South of the Sahara is an immense territory. In size, it is about equal to the United States, India, and China combined. In this vast area of some nine million square miles, there live only 145 million inhabitants; appreciably less than in the United States alone. The distribution of this population is most varied and, in the main, follows the variations in soil fertility and the distribution of disease. Apart from the centres of urban concentration, in most areas it is thinly scattered through country rugged in the extreme and with poor communications, especially in desert and semi-desert areas. Although a number of roads and railways run inland from seaports around most parts of Africa, there is as yet no completely integrated network of road or rail transport. Air transport, which has come as a great boon to Africa, has developed mainly between North and South, while East-West connexions are still scarce. This is a modern illustration of the fundamental division between East and West Africa which has existed from time immemorial and which touches also the epidemiology and the distribution of diseases. Add to this the extraordinary variety in ethnic groupings throughout the region and a picture emerges of a continent so complex that, at first sight, it appears to defy generalizations of any kind.

However, on closer examination, there are certain characteristics which are common to the region as a whole. For one thing, there is an urge toward cultural development, educa-

* This paper was presented by Dr F. J. C. Cambournac, WHO Regional Director for Africa, at the Eighty-Seventh Annual Meeting of the International Health Alumni, Atlantic City, N.J., USA, and is reprinted from *Amer. J. publ. Hlth*, **50**, No. 6, Suppl., p. 13, by kind permission of the Editor.

tion, and an improvement in living standards on the part of the population which is well-nigh universal; there is a dynamic of development, an eagerness for knowledge and self-improvement which manifests itself in an open-minded receptiveness of new ideas and practices and which, taken at the flood, can lead to tremendous advances for Africa.

Rapid economic development is now almost the general rule throughout the region, and any progress in the field of public health should form an integral part of social and economic development as a whole. Otherwise, efficient campaigns against disease might well result in population increases outrunning productivity, in which case the evil of disease might be replaced by the evils of malnutrition and food shortage.

The most important obstacles to progress in the central part of the continent of Africa were, in the past, difficulties of access to, and the great distances from, the coastlines; the shortage and inadequacy of transport and communications; the lack of fertility of soil in many areas; adverse climatic conditions; scattered populations; and, above all, the high incidence of tropical diseases, which also account mainly for the low density of its population.

From the public health point of view, the impact of climate is twofold: first, the limitations imposed by the climatic factors themselves on human activities, health, and comfort; and second, the extent to which climatic factors, more specifically rainfall and temperature, influence the epidemiology, geographical distribution, and severity of diseases in man and animals.

I should like to take this opportunity to pay tribute to all those scientists who, by their tireless efforts to improve living conditions, have made the development of these tropical areas possible. Among these efforts, it is important to remember all the work done to counteract the effects of adverse climatic conditions; to improve housing and control the growth of cities; to correct malnutrition and enable populations to partake of adequate and well balanced diets, a condition of which is the storage of food in circumstances which preserve its quality and purity. Nor should we overlook the improvements wrought in environmental sanitation or the achievements of agriculture and civil engineering to promote land drainage and irrigation, to check soil erosion and to create systems of communication. And pre-eminent among these is the fight against diseases, particularly communicable diseases, whose control or elimination is a pre-condition of all other forms of improvement.

In trying to give an account of present health conditions and the diseases present in Africa, I have to limit myself to a summary since time does not allow me to enter into details. Public health problems in Africa do not differ very greatly from those found in other tropical areas, except for certain peculiar types of disease, such as sleeping sickness, which is only to be encountered in this continent.

From the public health point of view, the African Region is still largely in the stage where eradication of major communicable diseases must be the main priority of any well-balanced public health programme. Strengthening of public health services everywhere is, of course, the main objective and campaigns against specific diseases are organized in such a way that they contribute to this over-all objective to the largest possible extent.

In spite of the fact that the conditions under which control campaigns against disease have to be carried out in Africa are more difficult than elsewhere, very important progress has been made there in the field of public health, particularly during the last ten years, due especially to the possibility of using modern methods of immunization and drugs which did not exist in the past.

Yellow fever has practically ceased to be a menace and only very few cases are nowadays encountered in certain areas, whereas in the past it was one of the greatest dangers to health in the region. Mass inoculation campaigns either against yellow fever alone, or combined with vaccination against smallpox, and mosquito control in urban areas have reduced the incidence to a rarity.

Smallpox is still present and outbreaks still occur, especially in West Africa. How-

ever, as a result of mass vaccination campaigns, it no longer creates havoc among entire populations while in many areas it has been completely eradicated.

Trypanosomiasis, despite all efforts made to control it and the good results obtained in vast areas, remains one of the most important health problems of Africa. This is particularly true of animal trypanosomiasis. By attacking cattle, this disease deprives African populations of meat and milk and it has been, without doubt, one of the greatest obstacles to economic development in many parts of the continent. But it is important as a human disease also and demands a high priority of consideration. There are several instances in the history of Africa of the devastating effect of human trypanosomiasis, which has, on occasion, depopulated fertile areas as a result of the losses due to the disease or of massive migration to escape death. One instance illustrating the damage which can be caused by this disease occurred in the year 1900, near the shores of Lake Victoria, when a population of 300 000 was reduced by two-thirds within a few months. It is known that climate is an important factor in its distribution and there are two distinct types of the disease to be encountered separately in East and West Africa.

However, the human type of trypanosomiasis has been largely brought under control in most inhabited areas. Due to mass prophylactic campaigns and the fight against glossinae, its incidence has become negligible over vast stretches of the continent. According to statistical data published by the Permanent Inter-African Bureau for Tsetse and Trypanosomiasis, the incidence of trypanosomiasis due to *Trypanosoma gambiense* dropped from 1948 to 1956 as follows:

	Total exposed population	*No. of cases per 10 000 inhabitants*
1948	77 339 478	6.90
1956	81 543 974	2.09

Bilharziasis, also, constitutes an important health problem and is one of the most widespread diseases in Africa. Attempts are being made in many places to reduce its ill effects and intensive research is carried out on a large scale. Surveys are continually being made but, as yet, it is not possible to point to satisfactory results in vast areas.

Onchocerciasis is a disease of considerable public health importance and is estimated to affect some 20 million people, particularly in West Africa. Intensive research is carried out, especially in areas where the epidemiology of the disease makes its control particularly difficult. However, the simulium vector has already been completely eradicated from areas measuring many thousands of square miles.

Tuberculosis is a very important problem for the entire region. But a considerable expansion has taken place recently in anti-tuberculosis work, and surveys designed to collect the epidemiological data indispensable for the organization of control campaigns have been carried out in very large areas of the region. Indeed, it can be said that almost all countries and territories in the region are now subject to survey by government teams or by WHO teams. Since similar methods are being used in these surveys, a very interesting vista has opened up for comparing the data obtained. In addition, it is worth mentioning that there are several mass chemoprophylaxis campaigns already under way in Africa.

In the field of leprosy the picture is very encouraging. In the antileprosy campaigns now under way, more than one million of the estimated total of 2 300 000 leprosy cases in the African Region are now under treatment with sulfones, and it is expected that nearly all will soon be reached. According to experts in this field who met at Brazzaville early this year, the percentage of arrested cases is high. The cost of these campaigns varies between $2 and $8 per patient per annum. At the present rate of progress, it is probably not too much to hope that the present generation in Africa will be the last to undergo this terrible affliction.

Malaria continues to be one of the most important health problems where it is estimated that a population of 116 million is at risk. Owing to a certain degree of immunity acquired in early childhood among this population, malaria mortality mainly affects

children. Generally speaking, urban and suburban areas in Africa are mostly free from malaria, as well as some rural areas, and it is of course in the latter that the malaria problem is present in its most acute form. In many cases it has been proved that residual spraying with insecticides alone did not suffice completely to interrupt transmission. However, considerable progress has been made in the study of the technical difficulties encountered in the effort to break the transmission, in the areas of Africa where those special circumstances occur. As against this, in other areas antimalaria campaigns have produced very encouraging results and special mention should be made of those obtained in efforts to interrupt transmission in the equatorial forest areas (Liberia and Cameroons, for instance).

Summing up the situation, it is possible to say that the results already obtained give rise to the hope that it will very soon be possible to establish the exact methods, or combination of methods, which will permit malaria eradication in any particular area of the African Region.

On the other hand, in certain zones such as the South Cameroons, in some parts of the Union of South Africa, Swaziland, in the Federation of Rhodesia and Nyasaland, and Mauritius, the surveillance stage of malaria eradication campaigns has already been reached; in yet other areas, large-scale eradication campaigns are under way, as for instance, in certain parts of the Federation of Rhodesia and Nyasaland, the Union of South Africa, Mozambique, Bechuanaland, and Zanzibar. According to local epidemiological conditions, eradication campaigns are based on the use of insecticides, complemented by antimalarial drugs distributed in mass prophylactic campaigns, to complete the action of the insecticides, where the latter cannot by themselves achieve complete interruption of transmission. Additionally, drugs are used in certain areas to attempt to shorten the duration of malaria eradication campaigns.

Technically speaking, the difficulties encountered are related especially to the peculiar behaviour of anopheline vectors, or the development of resistance by *Anopheles gambiae* to insecticides of the dieldrin-BHC-chlordane group. However, no case of resistance against DDT on the part of any anopheline species has as yet been recorded from any part of the African Region. The choice of method, or combination of methods, used in malaria eradication campaigns is, in the circumstances, based upon the results of thorough, pre-eradication epidemiological surveys, especially made to study the behaviour of the anopheline vector and its degree of sensitivity to the insecticides to be utilized.

There are indeed various sectors in the far-flung battle line against disease in Africa where the enemy is in full retreat. A massive campaign against yaws, which has now been under way for some years, has already reached 17 million people examined, of whom more than eight million have received the required treatment. This has brought the eradication of yaws within sight, among others, in Liberia, Ghana, and Nigeria—where it no longer constitutes an important public health problem. And in this connexion I should like to tell you of a most encouraging development which has taken place in Nigeria. As the mass campaign against yaws in that country reached the integration stage, a spontaneous movement among the population of certain regions resulted in the raising of voluntary contributions to develop and maintain rural health centres to deal not only with the remnant of the yaws problem but also to watch over the general well-being of the people. Here is a well-nigh perfect instance of one of the fundamental principles of WHO, as defined in its Constitution, in process of application. I quote: " Informed opinion and active co-operation on the part of the public are of the utmost importance in the improvement of the health of the people."

To sum up, the progress already made indicates clearly that yaws is one of the diseases which will be eradicated from Africa in the near future.

The fight against other treponematoses, such as endemic syphilis, has also met with encouraging results, for instance, in Bechuanaland.

Many other diseases could, if time allowed, also be mentioned which are of public health importance in Africa, such as, among others, virus diseases, helminthiases, and diseases due to protozoa not already referred to. However, I believe that the summary thus far presented gives at least an indication of the present situation regarding the most important and widespread diseases in the African Region.

The fight against tropical diseases has, during the last ten years, been characterized by the search for methods to apply the most recent scientific discoveries on a mass basis, such as those in the field of immunization, of chemoprophylaxis, and the use of insecticides against diseases which, in the past, rendered vast areas of tropical countries uninhabitable. But this application of modern methods on a mass scale requires a complete knowledge of the epidemiology of the diseases concerned, as well as a faultless system of " logistics " designed to achieve the utmost possible effect within the limitations imposed by the time factor as well as the availability of funds.

Any résumé of present public health problems in Africa would be incomplete without a reference to the developments which have taken place in what can be called the basic public health services, as well as nutrition. In this latter case much remains to be done but important developments have already taken place especially as a result of the interest of governments in the training of personnel to work in this field.

Maternal and child health, as well as nursing services, have also been considerably developed in recent years and, here again, training of personnel has proved the greatest need and has been strongly emphasized.

In environmental sanitation important developments have taken place, such as the provision in rural areas of water supplies and of latrines which, in recent years, have been constructed by hundreds of thousands in some places. While this is so, and while it is also true that many water-borne diseases have disappeared from many cities and some rural areas, I can only say that much remains to be done in these fields. Although great efforts have been made by the public health authorities concerned, it must be recognized that there is still a long way to go before it can be claimed that health conditions all over Africa can compare favourably with those areas where standards are high and where communicable diseases generally have ceased to be important public health problems. And, furthermore, the task is made at once more difficult and more vitally important by the tremendous economic development which is now taking place in most parts of this vast continent. Public health authorities in Africa must be ever on the alert lest economic expansion produce fresh health hazards; in fact, they have to insist that health considerations are adequately recognized in the earliest planning stages of all economic developments.

During the technical discussions held by the WHO Regional Committee at its meeting at Nairobi, Kenya, last September, on the subject of " Medical aspects of urbanization in Africa South of the Sahara " [1] it clearly emerged that public health authorities all over Africa are alive to the fact that, among all forms of economic expansion, it is precisely urban development which contains the greatest potential health risks.

Nor should the social aspects be overlooked. It should be recognized that the rapid formation of large aggregations of urban and industrial populations creates problems over and above those of housing, sanitation and the provision of health services, particularly when such populations undergo a sudden transformation from tribal to urban and industrial patterns of society. The hope was expressed that the considerable body of knowledge contained in the present state of the medical and social sciences could be adequately brought to bear to guide this development.

All that which has already been achieved in Africa has been due to the tremendous efforts made by governments and their health services, either alone or in co-operation with international organizations, and is an indication and augury of the great interest they

[1] See *WHO Chronicle*, 1960, **14**, 173

have in the subject. At this point the question may arise: " What exactly is WHO trying to do? "

WHO is trying to help governments to help themselves in their efforts to improve health conditions in the African Region. Sometimes WHO is the only international agency which affords assistance and, on other occasions, it does so in co-operation with other international organizations. An indication of the extent to which this kind of assistance is appreciated and sought after by governments is the fact that the number of projects in the Programme and Budget Estimates submitted to the WHO Regional Committee for Africa has risen from 36 in 1954 to 292 in 1959.

In planning its activities, the WHO Regional Office for Africa closely adheres to the principle that, since progress in the field of public health has created the opportunity for social and economic advance, such advance must follow in order not to create an unbalance in the social and economic structure.

The assistance given to countries and territories of the region consists largely of practical help in the organizing, developing, and co-ordinating of surveys and campaigns against communicable diseases, as well as work in the field of nutrition. Increasing stress has been laid on the creation and development of an extensive network of national health services capable of absorbing and administering the special services launched to deal with specific problems. Also, increasing importance is given to the organizing of basic public health services in conformity with the policy laid down by the World Health Organization.

Furthermore, the creation and development of rural health centres and dispensaries operating under their control, when added to the already existing network of health services, greatly enhance a country's capacity to improve the health of its people, as well as serve as training grounds for medical personnel, particularly auxiliary personnel. These rural health centres are extremely useful in the consolidation, integration, and surveillance phases of campaigns against specific diseases.

Such developments, of course, call for greatly increased staff and, in its programme for the African Region, high priority has been given by WHO to the training and instruction of personnel, as the best means of reinforcing and developing existing health services. Also, ready and whole-hearted co-operation on the part of the people is essential if health services are to function effectively and, for this reason, considerable attention is paid to the subject of Health Education of the Public, while, at the same time, a special effort is made to obtain the support of well informed public opinion.

Africa is indeed developing rapidly. I have tried to indicate that the state of public health in Africa has exercised a profound influence on the state of development in other spheres. While the rate of progress is so rapid in most of these, particularly in economic development, production of electric power and communications, one can be confident that standards of health and living will continue to improve at the same pace. It is precisely the improvement in communications and transport facilities which makes it possible to spread modern medicine and modern methods of public health administration into areas hitherto difficult to reach. And, considering the great urge toward self-improvement on the part of the people of Africa, even more rapid development can be expected to take place in the future.

FEEDING PREFERENCES OF MOSQUITOS

Malaria is transmitted only if a mosquito bites two individuals successively at a suitable interval, the first being infected and at a stage where the parasite is infectious to the mosquito. At the first bite the mosquito ingests the parasite, and at the second transmits it. For infection to take place, too, sufficient time must elapse for the parasite to pass through the various stages of the sexual phase and reach the mosquito's salivary glands, when it becomes infectious to man. It has long been known that mosquitos feed not only upon man but also upon various animals, particularly mammals, and occasionally reptiles and birds. It is also known that they do not feed exclusively on one host but can feed on several, depending on circumstances or on the presence or numbers of possible hosts. It is clear, however, that the importance of anopheles as a vector depends largely on its preference for human blood and on its opportunities for contact with man. In order to elucidate certain biological problems that still obscure our knowledge of the epidemiology of malaria, it is thus of prime importance to determine the feeding preferences of anopheline species capable of transmitting malaria. Some regional or local failures in malaria eradication campaigns are undoubtedly due to relative ignorance of the insect vector's habits, behaviour, movements during the gonotrophic cycle, and host preferences, and to variations in these factors due to climate, geographical situation, fauna, agricultural development, population, etc.

These are questions that arise all over the world for hundreds of research workers, malaria institutes, and WHO team members. Studies of the feeding habits of mosquitos using traps or laboratory methods with different hosts in conditions that are necessarily not natural give partial results but are difficult to standardize. In recent years, therefore, much interest has been shown in a method that is not new but has been steadily improved: the *precipitin test*, which enables the source of the blood ingested by mosquitos to be determined serologically.

The idea of examining the stomach contents of vector arthropods to find out what they feed on dates from the beginning of the present century. Koch examined microscopically the stomach contents of tsetse flies he suspected of feeding on crocodiles. Needless to say, microscopic examination that will distinguish the blood of reptiles or birds cannot distinguish between the blood of different kinds of mammals. The precipitin test, which was derived from Nuttall's work on the antigenic relationships of animal sera and their correlation with zoological classification, was improved at the beginning of the century and used in the twenties and after to study the food preferences of mosquitos. Boyd in particular carried out over 48 000 tests from 1930 to 1944, and to him we owe most of the information available ten years ago on the degree of preference of various anopheline species for human or animal hosts.

Collaboration of WHO and the Lister Institute of Preventive Medicine

In 1955, when the world-wide malaria eradication campaign was launched, WHO felt that the precipitin test should be used on a large scale to identify the origin of the last blood meals of anophelines and so permit assessment of their degree of contact with man. It considered that there was a good case for making precipitin testing freely available to interested field and research workers, especially as it was becoming obvious that the disappointing results of some spraying campaigns were due to ignorance of the behaviour of the vectors.

In 1955, by arrangement with WHO, a centralized service was set up at the Lister Institute of Preventive Medicine, Elstree, England, to determine the origin of blood ingested by anophelines. This service is

available to WHO personnel and to research workers engaged in mosquito control work. Blood specimens come from all over the world to the Institute, and are there examined by serologists who use standardized techniques and highly specific sera in order to determine their origin. From 1955 to 1959, more than 56 000 tests were carried out on 51 species of anopheles from some 30 countries. This undertaking, unprecedented in its size and variety, has already given some very interesting results: results that have led at times to a revision of accepted ideas and thrown fresh light on the behaviour of vector mosquitos.

In organizing this service WHO's main purposes were to stimulate interest in the study of the biology of anopheline species and their vectorial importance by providing research workers with facilities for the identification of the blood ingested; to eliminate experimental error by the use of a standardized, dependable serological technique and a wide choice of highly sensitive sera; and to improve thereby the planning of malaria eradication in the areas where least was known about the habits of malaria vectors.

In a paper in a recent issue of the WHO Bulletin,[1] the Division of Malaria Eradication, WHO, and the Lister Institute of Preventive Medicine review the results obtained by this service and discuss its future prospects.

Principle and technique of the test [2]

The field worker prepares the specimen for despatch by identifying the mosquito, detaching the abdomen of the female, gorged with blood, squeezing the abdominal contents on to filter-paper (one piece of filter-paper will take several specimens), and sending the filter-paper to the Lister Institute in special boxes, taking all due precautions to prevent its being spoiled. At the Institute each blood spot on the filter-paper is cut out and placed in a small test-tube, to which physiological saline is added to extract the blood proteins. The extract is tested with a specific serum —antihuman, antibovid, antihorse, etc.— prepared from rabbits, and the formation of a precipitate at the junction of the two liquids indicates a specific antigen-antibody effect. The tests vary according to whether the research worker simply wants to know whether the blood is of human or animal origin or whether on the other hand he wants to know what species of animal has been bitten. If the latter, he carries out more elaborate tests—serum absorption and inhibition of agglutination tests, for example—, but these are rarely required for the study of malaria vectors, which is limited usually to the categories of man, cattle, horse and ass, sheep, goat, and pig.

Results of test and biology of anophelines

The precipitin tests carried out on a large scale between 1920 and 1950 led to a revision of certain ideas based on less systematic and less subtle methods. Once more it became clear that the definite or absolute classifications proposed by biologists did not correspond to reality; the classification of mosquitos, for example, as " anthropophilic " or " zoophilic ", implying an exclusive preference for man or animals, was far too rigid and summary. The term " zoophilic ", too, gave no information on the animal species preferred, and the difference between the two groups was one of degree rather than of nature, there being actually a whole range of preferences, depending in particular on the climatic and other conditions in which the mosquitos lived. Thus the long-established belief that *A. gambiae* was completely anthropophilic had to be discarded. In 1947 this species was reported to be abundant in the uninhabited Semliki forest, and in 1948 it was shown experimentally that the *A. gambiae* complex fed almost indiscriminately on man, cattle, goat and pig. In the Lake Chad area it was observed to bite domestic animals, particularly the horse, as well as man. It thus appeared that *A. gambiae* could subsist in various parts of Africa independently of the presence of man. Recent results have confirmed these views. In the Western

[1] *Bull. Wld Hlth Org.*, 1960, 22, 685

[2] The technical details of the test are described by B. Weitz, in *Bull. Wld Hlth Org.*, 1956, 15, 473.

Sokoto Project in Northern Nigeria, 95% of 468 *A. gambiae* collected in houses were positive for human blood; 79% of 195 collected in stables were positive for horse blood; and in mixed habitations 72% of 96 were positive for man, 24% for horses and cattle, and 4% contained mixed blood. In Taveta-Pare (Tanganyika), where people share their abodes with cattle, 70% of tests were positive for man; but in villages of areas rich in cattle the proportion was approximately equal (41% for man, 51% for cattle). In open air shelters, on the other hand, the proportion was 13% for human blood, 74% for animal blood.

Generally, however, the results of the tests, and particularly the "human blood ratio" (the ratio of the number of tests positive for man to the total number of positive tests), were in agreement with what was known of the importance as vectors of the species of anopheles examined. In spite of local or regional differences, certain species taken as a whole recorded high (more than 75%) ratios for human blood. These were *A. barbirostris, gambiae, funestus, leucosphyrus leucosphyrus, hancocki, moucheti, nili, sundaicus* and *wellcomei*. In the following species the ratio was only 5-10%: *A. aconitus, annularis, cinereus, demeilloni, fluviatilis, hyrcanus sinensis, implexus, kochi, maculatus, maculipalpis, maculipennis, oswaldoi, pretoriensis, punctimacula, rivulorum, rufipes, subpictus malayensis, superpictus, triannulatus davisi* and *vagus*.

Value and limitations of test

The precipitin test has no absolute value. Its results must be assessed in the light of other data: the presence or absence of the preferred host; the characteristic behaviour of the species; the density of the anopheline population; the season; the climatic conditions; the time and technique of mosquito collection; and the conditions and microclimate of the collection site.

What attracts a mosquito to one host rather than another, and what limits are there to this preference? Very little is as yet known about the internal and external factors guiding a mosquito's choice. According to a recent study,[3] the stimuli are smells, exerting their effects with the aid of temperature and air movements. Laarman holds that blood undoubtedly contains attractive odorous substances that most probably play a part. Experiment has shown that *A. atroparvus* clearly distinguishes between man and rabbit. In nature, it is probable that the odours emitted by man and animals, the nocturnal rest rhythm, the skin surface exposed, and the ease of access to capillaries are all variable factors influencing the mosquito's choice. To these must be added genetic factors and endophilic and exophilic tendencies—themselves relative, for it has recently been shown that young females prefer to feed outside and older females inside houses. All these variations in behaviour must be taken into account along with the serological tests to obtain a proper picture of the characteristic habits of an anopheline species. The two types of research—serological and experimental study of natural behaviour—are complementary. On the one hand the number of precipitin tests must be increased; on the other, experimental methods of trapping mosquitos to which several hosts are available must be developed. Studies from this dual standpoint could be started straightaway: on *A. sergenti*, for example, in the Jordan valley—a mosquito whose feeding preferences are imperfectly known and which is responsible for a low transmission rate in Israel, Jordan and Syria; and on *A. gambiae* in Mauritius—here the human blood ratio is low and the hosts are unknown.

Changes in behaviour

The precipitin test may be of great help in studying possible changes in the behaviour of mosquitos subjected for a prolonged period to insecticides in areas where these have been used for years. An example is found in the Bobo-Dioulasso area of the pilot project in the Republic of Upper Volta. Here the differences observed in 1958 were striking: the human blood ratio for *A. gambiae* for villages not treated with DDT was 93%, and for treated villages 76%. For

[3] Laarman, J. J. (1955) *The host-seeking behaviour of the malaria mosquito*, Utrecht

A. funestus the difference is still more marked: 97% as against 14%. These figures are clearly indicative of " avoidance behaviour ": the mosquitos quit the habitations treated before they have absorbed a lethal dose of insecticide and have less opportunities for biting man outside. Comparison between habitations treated with dieldrin and with DDT shows that DDT is more irritating and induces avoidance behaviour to a more marked extent than dieldrin. Are these changes in behaviour temporary, or does spraying over a period of years cause a lasting change in the habits of the species? Observations in Greece on *A. sacharovi* seem to favour the second alternative, but more intensive research is needed.

Transmission of malaria depends in the last analysis on the susceptibility of the mosquito to the parasite and on the opportunities it has for biting a man at a favourable moment, becoming infected, and biting another at the crucial time when it can infect him. In 1910 Ross estimated the percentage of infected mosquitos belonging to " good vector " species and having the opportunity to bite man a second time at 4%. Although its chances of finding its essential hosts at the critical stages of its development are small, the plasmodium has maintained itself in the world for thousands of years, having, as Sherrington remarks, overcome with ingenuity great obstacles to perpetuate itself.[4]

[4] Sherrington, C. (1955) *Man on his nature*, Harmondsworth, Penguin Books, p. 278

Reports of Expert Groups

Expert Committee on Tuberculosis *

Antituberculosis work has been facilitated by a number of non-specific factors and in particular by the raising of living standards, but specific control methods are still valuable and have, in fact, become increasingly effective.

In many countries, emphasis was placed in the past on the care of individual tuberculous patients, particularly those in hospital. Today control measures can be extended to whole communities.

The control programme proposed by WHO lays particular stress on the public health approach to this problem. Owing to the progress made in the last ten years, and in particular to the introduction of effective antituberculosis drugs, it is now possible to extend control to countries that were not previously able to adopt effective measures against the disease.

A WHO Expert Committee on Tuberculosis [1] met from 28 September to 3 October 1959, in Geneva, to review recent developments in the field of tuberculosis in general, as well as the WHO control programme. Its report has just been published.

Epidemiological aspects

Data on tuberculosis mortality are still considered useful for international comparison provided the countries from which they are drawn have adequate death registra-

* WHO Expert Committee on Tuberculosis (1960) *Seventh report* (*Wld Hlth Org. techn. Rep. Ser.*, No. 195), Geneva, 19 pages. Price: 1/9, $0.30, Sw. fr. 1.—. Also published in French and Spanish.

[1] Members of the Committee: Dr E. Aujaleu, France (Chairman); Dr P. V. Benjamin, India (Vice-Chairman); Dr I. MacGregor, United Kingdom; Dr J. E. Perkins, USA (Rapporteur); Professor N. A. Schmelew, USSR; Dr G. J. Wherrett, Canada; Sir Harry Wunderly, Australia. Secretariat: Dr J. Holm, WHO (Secretary); Dr M. De Marchi, WHO; Dr L. Sula, WHO.

tion systems. On the other hand, morbidity data are not considered suitable for international comparison, although they may be useful for following the trend of tuberculosis in a given country or area.

In many parts of the world, especially in those where the tuberculosis problem is greatest, no reliable data are available, so that prevalence surveys have to be made to obtain the information required for the planning and evaluation of a control programme. For purposes of international comparison, perhaps the most reliable data are those indicating the proportion of persons excreting the tubercle bacillus, the second best being data on the prevalence of significant shadows in chest X-ray films. Data on the proportion of positive reactors to the tuberculin test are also of great importance, provided that the existence of non-specific positive reactors and of the possibility of previous BCG vaccination is taken into account. The tuberculin test is in any case a valuable pointer to the tuberculosis situation in countries where the prevalence of the disease is low.

Tuberculosis epidemiology varies considerably from one country to another. It would be desirable for all countries to make local epidemiological studies to determine the relative importance of the several ways in which the disease spreads (family contacts, bovine tuberculosis, tuberculosis in other animals, etc.).

Methods of examination for pulmonary tuberculosis

The tuberculin test is one of the most valuable tools in the antituberculosis workshop. The Mantoux intracutaneous test is considered the best method for the diagnosis of tuberculosis, if correctly applied (using a standard dose of a well-standardized tuberculin) and correctly read. The reading should be taken after three days, and the result recorded. Results should be reported in millimetres on the basis of the largest transverse diameter, rather than merely given as " positive " or " negative ", so as to permit comparison of results from different areas. The Committee discussed the problem of non-specific reactors and arrived at the following conclusions: a reaction of less than 5 mm indicates in all probability that the person *is not* infected; a reaction of 10 mm or more indicates in all probability that the person *is* infected; a reaction measuring 5-9 mm indicates that infection is doubtful and, if precise determination of infection is essential, a careful clinical and laboratory examination should be made of the person concerned.

Research is continuing into tuberculin testing and it is hoped that, by the use of more than one antigen or some other procedure, it may be possible before long to determine more definitely in every case whether *Myco. tuberculosis* infection exists or not.

The Committee considered that chest X-ray examination by radio-photography or radiography is extremely valuable in tuberculosis control and that the amount of radiation from properly constructed and properly operated appliances is negligible compared with the advantages of this procedure. The desirability of tuberculin-testing before X-ray examinations, in order to reduce exposure to radiation, depends upon local circumstances (prevalence of tuberculosis infection) and should therefore be determined locally. Nevertheless, in countries where the prevalence of tuberculosis among children is low, radiological examination in the younger age groups should be confined to children shown to have been naturally infected.

It is of course very important that X-ray apparatus should be sturdily made and easy to transport, handle and maintain—and this presents difficulties, particularly in economically under-developed countries. The Committee expressed the view that standardization of all radio-photographic appliances is also very desirable. The report recommends that the reading of films should be done independently by two qualified persons.

Another practical method used in many countries is microscopic examination of the sputum for detection of the tubercle bacillus. This method is relatively reliable, but it has the obvious disadvantage of being less sensitive than examination by culture. Present

techniques for the latter type of examination are, however, not sufficiently simple for mass application.

Preventive measures

Present knowledge and experience show that BCG vaccination confers a considerable degree of protection against tuberculosis, that its disadvantages and risks are negligible, and that it can be applied as a mass measure without undue difficulty as to cost or personnel. The report therefore recommends that BCG vaccination be given prominence in the antituberculosis programme in most countries. Its exact place in the programme will depend upon the epidemiological situation and the existing facilities for combating tuberculosis in each country. When the prevalence of tuberculosis in a country has fallen to a sufficiently low level, BCG vaccination may be confined to certain population groups particularly exposed to the risk of infection.

Chemoprophylaxis is considered as adequate only in areas where the disease is highly endemic; in such areas, isoniazid should be administered to cutaneous reactors to tuberculin who have not been recently vaccinated with BCG and who are associates of infectious cases.

Traditional preventive measures such as the isolation of infectious patients are still valid and should be applied wherever practicable.

Treatment

The great problem in tuberculosis control throughout the world is to ensure that all tuberculous persons are treated.

Resistance to drugs, and especially to isoniazid, has not proved to be as serious a public health problem as was anticipated, although there is a need for international standards for the determination of drug resistance that will permit comparisons to be made from one area to another.

It is recommended that drug treatment be applied to all persons found, upon chest X-ray examination, to have shadows likely to indicate tuberculosis, even when the sputum is negative. This recommendation, however, refers only to persons who cannot be subjected to thorough physical examination and it is put forward in the light of recent research indicating that persons showing such shadows are more liable than others to develop active tuberculosis.

In countries where resources are limited and in which tuberculosis is a serious problem, it is advisable to concentrate efforts in the first place upon mass home treatment with antituberculosis drugs, leaving hospital construction to a later date. However, where beds are available for tuberculous patients, all measures likely to protect the community should be taken, including the hospitalization of patients at least long enough for their thorough clinical examination, their education in regard to the disease, and their segregation until they are no longer infectious. In most cases, adequate treatment with drugs eliminates the need for surgical intervention, though this is not always avoidable.

Case-finding

In countries with well-developed tuberculosis control systems, fixed clinics are preferable to mobile teams since they can serve as both diagnostic and treatment centres. They should, however, have mobile units for group examinations.

Mass X-ray case-finding programmes have been found to be useful for the rapid coverage of large adult populations. They should, however, be followed by more selective operations paying special attention to the examination of groups in which prevalence is known to be high, groups in which there is more than average risk of infection, and certain professional and other groups whose members may constitute a special danger to others if they develop infectious tuberculosis.

In these selective programmes, re-examination about every three years would seem to be sufficient except in the case of certain " high risk " and " danger " groups.

In countries where tuberculosis is a serious problem and control is in its early stages, fixed clinics are a first necessity for the examination in large numbers of persons suspected of being tuberculous and their

contacts, and for the treatment of confirmed cases; as soon as possible, mobile units should be attached to them.

Organization of a tuberculosis programme

As tuberculosis constitutes a social problem, its control must be an integral part of the community's public health programme. The report recommends that the aim of all tuberculosis control should be eradication of the disease. This means that in countries where the prevalence is high, the immediate problem will be that of organizing services capable of reducing the number of cases.

As a rule, the disease cannot be considered as having ceased to be a public health problem until the proportion of natural reactors to tuberculin among children under 14 years of age has become less than 1%.

The various stages in starting a tuberculosis control programme in a country should be: a planning stage; a pilot stage, including a national pilot area project, detailed prevalence surveys, and the establishment of a national epidemiological centre for tuberculosis; finally, extension of the programme from the national pilot area to the rest of the country.

The role of WHO

The report finally considers WHO's part in the world programme for the control of tuberculosis and the assistance the Organization gives to the various national programmes.

One of the principal problems in nearly all countries is the shortage of suitable personnel. WHO is collaborating in the training of the various categories of staff and in the organization of the necessary courses and services. National pilot area projects are to be used as training centres for most of the personnel needed for control programmes in the different countries. It is recommended that, wherever practicable, professional key personnel be trained as close as possible to their home countries and that, in order not to waste the time of highly trained professional staff, the programme for the training of technicians (BCG, X-ray and laboratory technicians, health educators, home visitors) should be intensified. Arrangements should be made for the continual evaluation of their work to ensure that they are used to the fullest possible extent but without exceeding the functions specifically assigned to them.

The report mentions the need for standardizing both epidemiological terms (applicable also to other communicable diseases) and clinical terms relating specifically to tuberculosis. Examples are such terms as "minimal", "moderately advanced" and "far advanced" to indicate the various stages of the disease. Reference is also made to the necessity for standardizing BCG vaccine and the International Unit of Purified Protein Derivative of Mammalian Tuberculin.

It is recommended that continued efforts be made to standardize techniques for the tuberculin test, for the reading of X-ray films, for the examination of sputum, and for other procedures necessary in tuberculosis control.

In view of the great importance of research in the field of tuberculosis, and of the present tendency to decentralization, the Committee emphasized the need for an adequately staffed central tuberculosis unit in WHO to co-ordinate research and in particular epidemiological investigations. This unit should also be able to distribute useful information to all persons interested in tuberculosis: it was felt that this could easily be accomplished by sending the information to the various Ministries of Health and national antituberculosis associations which could in turn ensure its wider circulation.

Epidemiological and Statistical Information

Infant mortality

The figures published for a large number of countries in a recent WHO *Epidemiological and Vital Statistics Report*[1] are indicative of trends in infant mortality, which is the most sensitive index of the degree of health and social protection in a community. These figures do not achieve statistical precision, owing to the great variations in infant death rates through the world, the use of different nomenclatures for diseases, errors in diagnosis, failure (for whatever reason) to state the true cause of death, incomplete or vague statements, and faulty classification.

Infant mortality, formerly heavy, has decreased to a remarkable degree, at least in the more developed countries of western Europe, the USA and some of the territories of the British Commonwealth. In these areas, the raising of the level of health, improvement in hygienic conditions, greater use of preventive vaccination, the increase in the number of physicians and health organizations, the discovery of effective medical treatment, and advances in medicine have all helped to reduce infant morbidity and mortality.

The statistics of infant mortality cover the annual number of deaths from 1901 to 1958. Since 1921-1925, there has been a decrease in infant mortality in all countries. Two different trends are noticeable among the countries that had high rates in 1921-1925. In some of them there has been a remarkable decrease, although it is far from being the same everywhere. The 1957 infant mortality rate, as a percentage of the 1921-1925 rate—at which time a general decrease became apparent throughout the world—, shows that the most important relative reduction occurred in Malta and Gozo, Singapore, Hawaii, Czechoslovakia, and the Netherlands. On the other hand, the decrease in countries like Guatemala, Uruguay, Yugoslavia, El Salvador, Portugal and British Honduras is much less. The infant mortality rates per 1000 live births are shown in the following table:

Country	*1921-1925*	*1951-1955*	*1956*	*1957*	*1957 rate as percentage of 1921-1925 rate*
Netherlands	70	22	19	17	24
Iceland	52	22	17	*17	33
Sweden	60	19	17	18	30
New Zealand	43	21	19	20	47
Norway	52	23	21	20	38
Australia	58	23	22	21	36
Switzerland	65	29	26	23	35
England & Wales	76	27	24	23	30
Denmark	82	27	25	23	28
Hawaii	121	22	23	*24	20
United States of America	74	28	26	26	35
Finland	96	32	26	28	29
Northern Ireland	82	37	29	29	35
Scotland	92	33	29	29	32
Union of S. Africa	73	32	31	*29	40
Canada	99	35	32	*31	31
Ireland	70	40	36	33	47
Czechoslovakia	154	49	31	33	21
France	94	43	36	34	36
Belgium	106	44	39	36	34
Luxembourg	110	42	37	39	35
Japan	159	48	41	40	25
Singapore	224	63	42	41	18
Malta and Gozo	266	70	43	41	15
Austria	138	51	43	44	32
Italy	127	58	49	50	39
Jamaica	176	70	*54	*54	31
Trinidad and Tobago	133	72	64	57	43
Hungary	187	69	59	63	34
Ceylon	190	75	*67	68	36
El Salvador	135	81	70	87	64
Portugal	146	91	88	88	60
Uruguay	106	*56	*73	*90	85
British Honduras	155	91	69	92	59
Guatemala	104	99	89	100	96
Yugoslavia	144	115	98	101	70
Chile	239	116	109	117	49

* Preliminary, approximate or estimated data

[1] *Epidem. vital Statist. Rep.*, 1960, 13, 53

In some countries the decline in infant mortality, which was very marked after the war, can be explained only if we also take into consideration the decrease in births.

The year 1958 marks a new record. As in preceding years, Sweden leads, with a rate of 16 deaths per 1000 live-born, which is the lowest ever recorded in the world. It is followed by the Netherlands and Iceland (17), New Zealand (19), Australia (20), and Switzerland (22).

Infant mortality rates are usually divided into two groups: deaths that occur in the first four weeks of life (neonatal), and those that occur later, up to the end of the first year (post-neonatal). It is in the latter category that the greatest over-all improvement (between 60% and 70% in many countries) occurs, as can be observed in the column opposite.

Country	*Percentage decrease in infant mortality rate between 1921-1925 and 1957*	
	Neonatal death rate	*Post-neonatal death rate*
Belgium	39	80
Luxembourg	49	76
Czechoslovakia	77	80
Japan	66	81
Hungary	60	71
Uruguay	+6	26
Chile	68	34
New Zealand	48	60
Iceland	57	77
Norway	45	73
Australia	50	79
Sweden	44	89
Switzerland	51	80
Netherlands	56	88
England and Wales	52	84
Scotland	47	83
Northern Ireland	35	82
Denmark	48	86

What are the causes of these infant deaths? Among the countries considered, the highest death rate is caused by haemolytic and haemorrhagic diseases of the newborn, neonatal disorders arising from certain diseases of the mother during pregnancy, nutritional maladjustment, ill-defined diseases peculiar to early infancy, and immaturity. Most of these causes exist at birth and practically all the deaths due to them occur in the neonatal period. The other two main groups of causes of death are: congenital malformations, birth injuries and postnatal asphyxia and atelectasis; and influenza, pneumonia and bronchitis. The first group is responsible for from a quarter to a half of infant deaths in all countries except Trinidad and Tobago, Venezuela, Ceylon, Japan, Portugal and Yugoslavia, and congenital malformations —the component responsible for the highest death rate—account for around 400 per 100 000 live births on the average (ranging between 306 for Canada and 491 for Belgium). The second group is responsible for between 6.9% (Sweden) and 28.8% (Yugoslavia) of infant deaths. Nearly all deaths in this group occur in the post-neonatal period.

In Venezuela, Hungary, Portugal and Yugoslavia, diarrhoea is an important cause of death, causing between 12.4% (Hungary) and 29.4% (Portugal) of deaths from all causes.

Notes and News

Improvement of rural living conditions in Mexico

"No community is opposed to improvement but only to unsatisfactory methods of promoting improvement." This statement of principle is the basis of an article which Dr R. Vega Rivera devoted recently to experiments made in a rural area of Mexico.[1] Health promotion in rural areas encounters many difficulties, particularly in the Bajío region of the Mexican uplands, which covers 4000 km² and has a population of 380 000, about half of whom live in some 400 rural communities. Most of these communities have never had any contact with health activities, and enteric and other diseases connected with bad hygienic conditions are widespread. To improve conditions a programme in four stages has been adopted: (1) protection and repair of sources of drinking water and other domestic supplies; (2) installation, use and maintenance of latrines; (3) installation of minimum prophylactic services; (4) measures for better domestic hygiene.

The success of such an undertaking depends *inter alia* upon the competence of the personnel entrusted with the programme, their knowledge of economic and social conditions in the regions in which they will be working, and their ability to get on with people. One very important factor is their psychological attitude towards the inhabitants of the area where they are working. A continuous effort must be made to keep up the morale of the people, to show them the progress that has been made, explain delays, and prevent impatience and indifference if the results are less spectacular than had been expected. Health workers must adapt themselves to the tempo of village life and remember that most of the inhabitants will not be particularly keen to spend their small amount of leisure on communal activities involving a certain responsibility.

Every programme of this type must proceed by the following stages: initial contact; circulation of information; collection of data; decision to proceed; execution of the programme; evaluation.

It is on the initial contact that the success of the whole undertaking depends. At this stage the villager's interest must be aroused, and the community's confidence and acceptance gained. The community selected should be the one which offers the best facilities for the execution of the work.

The second step should be the wider diffusion of the programme's aims. A first meeting should be held with a small group of community leaders. A clearly defined objective should be laid down so as to avoid unnecessary and involved discussions.

After this first meeting the need for another, with more participants, can be suggested, but this should not be held for one or two weeks so that the original group and their families may have time to discuss the advantages and disadvantages of the action proposed.

Very often the initial contacts will be sufficient. However, for a project of any size, accurate demographic, socio-economic and health data must be procured, together with information on the community's resources.

These data can be obtained from the local leaders, and passed on to the competent technical service.

The decision to approve the programme must always be based on free discussion of the proposed action and its cost. When the programme provides for cash repayment, the timing of the repayment to be made is very important: the best system is to arrange for it to be made after the harvest, rather than to fix a specific date.

There is no reason why the decision to proceed and the organization of the programme should

[1] *Bol. Ofic. Sanit. Panam.*, 1960, **48**, 12

not be simultaneous. In most cases, the community leaders automatically assume responsibility for the application of the programme. In larger communities a committee may be set up to take charge of the administration, execution and supervision of the work, and possibly to suggest future activities.

Evaluation can be effected either after each stage of the programme or at the end. If there is slowness in passing from one stage to the next, the reason should be sought and the system of work improved accordingly.

The final evaluation should be both quantitative and qualitative. Quantitative evaluation will cover such factors as the number of measures undertaken, the cost, the number of persons benefiting, etc. Even more important in a programme of this type is the qualitative evaluation, which will take into account the reactions of the community to the innovations, the use they make of them, and their desire for further progress.

Public health teaching in Latin America

Social development, economic progress, and community health form an inseparable triad. Progress in health is hindered in socially and economically unproductive surroundings; economic and social progress is held up when community health is at a low level. None of the three members of the triad can get very far unless accompanied by the others, and they must all be in reasonable step. This is a fundamental concept which, although it complicates matters, strengthens and gives balance to planning for health.

This briefly summarizes the views of Dr Abraham Horwitz, Director of the Pan American Sanitary Bureau, which acts as the WHO Regional Office for the Americas; views expressed at the conference on public health schools held in Huasca, Hidalgo, Mexico, in November 1959.[1] Dr Horwitz, reacting against the excessive technological bias that produces in the mind of the future doctor a distorted idea of his mission and, in the last analysis, a dehumanization of medicine, advises South American universities to revive the principles of Hippocratic medicine, which seeks to understand man as a whole, a biological entity in thought and in action and a social being.

For 2500 years Hippocrates has personified the pragmatic approach of Aesculapius and the humanist traditions of Hygeia. The followers of Aesculapius believed that the physician's chief task was to treat disease and restore health, remedying the defects caused by the contingencies of birth or of life; to the followers of Hygeia health was a positive attribute to which man can aspire if he rules his life wisely. In accord with these views, René Dubos [2] has said that the most important function of medicine is to discover and teach the natural laws whereby man can achieve *mens sana in corpore sano*.

The relation of the community to health is the same as the relation of man to medicine. Every community is an essentially dynamic organism, the component parts of which are interdependent and exert a mutual influence on each other. Health problems and ways of solving them should, therefore, be viewed as a whole and in relationship with the other factors influencing community welfare and social progress.

The times in which Latin American countries are living—Dr Horwitz maintains—make it necessary to conceive of health as an essential component of welfare and consequently of economic development. Health activities do not progress as they might be expected to when they are carried out in a society that is relatively static in respect of other fundamental functions. In other words, health work is of limited effect in a static economy. If professional training is viewed in this light, health specialists cannot restrict their knowledge to specific problems and techniques of dealing with them or, worse still, analyse them out of context. They should instead find out about the community in which they are going to work, the characteristics of the human groups of which it is composed, the extent of the problems hindering its progress, and how to work in harmony with other technical experts.

The conference on schools of public health at which Dr Horwitz spoke met to enable a group of teachers of public health to discuss

[1] *Bol. Ofic. sanit. panamer.*, 1960, **48**, 337

[2] Dubos, R. (1959) *Mirage of health : utopias, progress, and biological change* New York

the best methods of training personnel more effectively to deal with health problems in Latin America. Thirty-three teachers and public health officers from Argentina, Brazil, Chile, Mexico, Peru, USA, and Venezuela were present, as well as PASB officials. The final report adopted by the Conference and a working paper on public health schools have been published in the PASB Boletín.[3]

Periodontal disease

Periodontal disease is the broad term used to describe a group of diseases affecting the supporting structures of the teeth. These structures (collectively known as the periodontium) comprise the bone of the tooth sockets, the cementum on the roots of the teeth, the membrane or ligament which holds the teeth in their sockets, and the gingiva, or gum tissue, surrounding the teeth. The progressive destruction of these tissues leads to loosening of the teeth and, if not checked by active treatment, to their loss. The infective process lowers the body's general resistance to other diseases and is slow and insidious, pain, the usual danger signal, being absent (or tolerable) until the later stages, when it is often too late to institute successful therapeutic measures.

Until recent years periodontal disease has not been given the attention it deserves as it has been overshadowed by dental caries which, in contradistinction to periodontal disease, destroys the hard tissues of the tooth itself. Both diseases are the result of abnormal bacterial activity but, while dental caries is initiated by an acid attack on the tooth enamel as a direct result of bacterial fermentation of carbohydrates (especially sucrose), periodontal disease usually starts as an inflammation of the gingiva followed by deposition of calculus around the necks of the teeth. In both cases a bacterial plaque is formed, and one of the puzzling features is why this plaque should promote acid formation in the case of caries and act as a framework for the deposition of calculus in periodontal disease.

There are other puzzling features and many gaps in our knowledge of periodontal disease. For example, progressive destruction of the periodontium can occur occasionally in the absence of calculus formation and when no visible bacterial plaque is present. Adverse systemic states, such as occur with nutritional deficiencies, endocrinological imbalances and debilitating diseases, are thought to be active in these cases and to lead to nutritional deficiencies within the cells of the supporting tissues, thereby causing cell degeneration and a general breakdown of these tissues. However, recent research indicates that while systemic factors undoubtedly disturb the normal resistance of the periodontium to disease, an invisible bacterial plaque may be the direct cause of its destruction.

Epidemiological surveys of periodontal disease have been made in many countries and, although the results are not always strictly comparable. owing to variation in the indices and recording methods used, sufficient evidence, both epidemiological and clinical, exists to show that in some countries and races periodontal disease is far more prevalent and a greater public health problem than in others. While this is particularly so in Asia and Africa, the incidence of the disease in European countries is such as to cause concern to the dental profession and health authorities. Surveys in these countries indicate that socio-economic status, nutrition and habits of oral hygiene also play a role in the initiation of periodontal disease.

The problem of periodontal disease has been reviewed by a WHO Expert Committee on Dental Health (Periodontal Disease) at a meeting convened in Geneva between 22 and 27 August 1960. When its report is issued it will be reviewed in the Chronicle.

Standardization of microbial sensitivity tests

A WHO Expert Committee on Antibiotics met in Geneva from 11 to 16 July 1960 to discuss the problem of standardizing methods of carrying out microbial sensitivity tests for both survey and clinical purposes. It examined the question of microbial resistance from the theoretical and the practical points of view. On the basis of information collected from laboratories in different parts of the world, it reviewed present methodology and made recommendations on

[3] *Bol. Ofic. sanit. panamer.*, 1960, **48**, 283–290

how reliable and comparable results could be obtained.

Teaching of the basic medical sciences today

The preventive aspects of medicine do not receive sufficient attention in the medical curriculum, and yet without knowledge of these aspects the medical student cannot properly appreciate methods of preventing congenital disease, for example; nor can he fully understand insecticide control of vector-borne disease, the resistance of bacteria and viruses to antibiotics or of protozoan parasites to drugs, or the application of scientific knowledge to the promotion of health. Moreover, it is only if the role of scientific knowledge in prevention is fully grasped by the medical student that the ranks of research workers will continue to be adequately manned.

A WHO Study Group met in 1957 to explore preventive aspects in the teaching of physiology, and in 1958 a WHO Expert Committee did the same for pathology. On 22-27 August 1960 an Expert Committee on Professional and Technical Education of Medical and Auxiliary Personnel met in Geneva to study the teaching of the basic medical sciences in the light of modern medicine. Its aim was to follow up the work of the two previous groups and review ways and means of introducing the concept of prevention into the teaching of the basic pre-clinical subjects of the undergraduate medical curriculum, and to study and promote co-ordination in the teaching of the basic sciences.

The report of this Expert Committee will be reviewed in the Chronicle when it is published.

Conference of national fellowships officers

Last year WHO awarded its 10 000th fellowship. About half of the persons to whom fellowships were awarded studied in Europe, whose universities still attract students from all over the world. The WHO Regional Office for Europe makes at present study arrangements for between 700 and 900 fellows a year, about half of whom come from other regions. Most of the technical and administrative work of preparing study programmes for post-graduate fellows has been done by medical officers in the receiving countries, and these medical officers met in Copenhagen from 22 to 26 August 1960 to discuss their common problems.

The participants in the Conference came from Denmark, France, Germany, Italy, the Netherlands, Sweden, the United Kingdom and the USSR, these being the countries in Europe which receive the greatest number of WHO fellows for training. The United Kingdom alone, for example, made study arrangements for more than 300 fellows in 1958. Most of the participants are officials of their own countries' health administrations with many years' experience of the WHO fellowship programme. The system employed, known as the inter-country method of work, enables WHO to administer a large fellowship programme with a very small technical and administrative staff of its own. For the success of the programme, however, it is essential that frequent contact be maintained between the fellowship officers of national health administrations and those of WHO. The last meeting of this kind in Europe took place in Geneva in 1955.

The agenda of the Conference contained an item on the selection of candidates for WHO fellowships. The proper selection of fellows is the main guarantee that the considerable funds and efforts devoted to this programme are properly spent. The onus of selecting the best candidates naturally lies mainly upon the governments which propose persons for the fellowship, but both WHO and the receiving government share the responsibility for the selection; to help them carry this responsibility they have vast experience of how the selected fellows go about their studies.

Another important item on the agenda was the preparation of the fellow's programme. Often there are many proposals about the programme; from the fellow himself; from his government; from the Regional Office (or Offices if he comes from another region); and from the receiving country's government or the receiving institution, or both. The problem is how best to make a synthesis of all these well-intended and useful proposals.

International reference centre for respiratory viruses

An International Reference Centre for Respiratory Viruses has been established at the Common Cold Research Unit, Coombe Road, Salisbury, Wilts, England, as part of a system of WHO Reference Laboratories. The work will be coordinated with that of the World Influenza Centre, which was established and assisted by WHO, and other laboratories at the National Institute for Medical Research, Mill Hill, London, N.W. 7. The work will be under the general direction of Drs C. H. Andrewes, D. A. J. Tyrrell and D. Taylor-Robinson, members of the staff of the Medical Research Council.

A main object of this and other reference laboratories is to attempt to maintain some order in the classification and naming of the many respiratory viruses now being identified. This can only be done through free interchange of information and strains of virus between workers in different countries.

Many virus laboratories must have isolated agents which they cannot identify. The Salisbury centre cannot undertake to identify any and all of these. It will be prepared to accept for study unidentified respiratory viruses if (*a*) it has proved impossible to name them with the aid of diagnostic reagents in the best equipped laboratories in the country of origin; or (*b*) as a matter of urgency if they seem to be associated with a serious outbreak of respiratory disease.

The centre will of course have to prepare diagnostic sera against "new" viruses; these will be available for exchange with other reference laboratories but, to begin with, not elsewhere.

Viruses requiring investigation are likely to include myxoviruses, adenoviruses, enteroviruses associated with respiratory infections, common cold viruses and some others such as reoviruses and respiratory syncytial viruses.

It is expected that more reference laboratories for respiratory and other groups of viruses will be set up shortly and that these will to some extent work on a regional basis.

Child guidance

The WHO Regional Office for Europe has held a number of seminars on mental health in children: in 1952 in Scandinavia; in 1956 in Switzerland; and in 1957 and 1959. Another—a seminar on child guidance—was held in Brussels between 29 August and 9 September 1960, and was attended by participants from a number of European countries. The subject of the seminar was the utility of child guidance centres, and among the topics discussed were the kinds of patients and families making use of the centres, the needs of communities, the aims of and services offered by the centres, the results of their work, research methodology, and the training of personnel.

People and Places

Insecticide susceptibility

Dr William M. Hoskins, Professor of Entomology at the University of California, USA, and chemist to the California Agricultural Experiment Station, was appointed WHO consultant in environmental sanitation for the period 14 June to 14 August 1960.

Dr Hoskins reviewed data obtained in the field with WHO test methods for determining the susceptibility of adult mosquitos and larvae to insecticides, gave advice on their analysis, and examined the question of their extension to malaria eradication projects. He visited research centres in the Netherlands, England, and Denmark to discuss recent advances in research on insecticide resistance and insect control and to suggest means of co-ordinating more closely research efforts, with particular reference to WHO interests.

Hospital administration in Viet Nam

Dr R. F. Bridgman has been appointed WHO consultant to advise the Government of Viet Nam on hospital administration, on the system

of reporting and on how to obtain uniformity in medical records.

Dr Bridgman, who is Deputy Director of Health of the Department of the Seine, France, is the author of the WHO monograph *The Rural Hospital* and a member of the Expert Advisory Panel on Organization of Medical Care. He has carried out similar assignments for WHO in other parts of the world, such as Egypt, Turkey and Greece.

Rehabilitation in leprosy

A Scientific Meeting on Rehabilitation in Leprosy will be held in the Christian Medical College, Vellore, India, from 21 to 29 November 1960. It will be sponsored jointly by WHO, the Leonard Wood Memorial, and the International Society for the Welfare of Cripples.

Mr Paul Brand, F.R.C.S., Professor of Orthopaedics and Plastic Surgery at the Christian Medical College, Vellore, has been appointed WHO consultant at Geneva to help in the organization of the Scientific Meeting and in the preparation of a guide to principles of prevention and treatment of leprosy deformities and disabilities in leprosy mass campaigns. Mr Brand has worked as a short-term consultant in the WHO Regional Office for South-East Asia, advising the Regional Director and governments on the organization of leprosy rehabilitation. WHO fellows are sent every year to study in his department at the Christian Medical College.

Sprayer evaluation project

A joint malaria eradication and vector control project is to try out sprayers that meet the basic WHO requirements in two countries of differing climatic, labour and housing conditions, and on the basis of their performance make an "approved list" of suitable sprayers and prepare replacement and maintenance schedules. In autumn 1959 and in spring 1960 two compression sprayers as yet unused in malaria eradication work and two others only used in the country of their manufacture were tested; in autumn 1960 and in spring 1961 stirrup pump sprayers and certain components of compression sprayers will be tested. In the earlier of these periods the compression sprayer most commonly used in the field at present was also tested, both to provide a standard by which to judge the others and to obtain precise information on its field performance.

Mr Alfred T. Lemierre and Mr Robert A. Fitzjohn have been appointed to assist in this project. The former received his *doctorat ès sciences* from the Institut national agronomique, Paris (with specialization in agricultural engineering), a rural engineering diploma from the Ecole du génie rural, and a diploma from the Centre des hautes études. He has worked as Assistant Director of the Centre de recherches de machines agricoles of the Ministry of Agriculture, France, and in 1954-1957 was Chef consultant sur essais de machines agricoles to the Organization for European Economic Co-operation (OEEC).

Mr Fitzjohn possesses certificates from the Royal Sanitary Institute (now the Royal Society for the Promotion of Health) in hygiene, sanitation, physiology and building construction, and has attended a course at the Ross Institute in London on medical entomology. After five years as a sanitary inspector in England and seven years, also in the field of sanitation, with the British forces, he went to Nigeria in 1946 and has been working there since in malaria projects. He has planned and carried out a number of experiments with and tests of spraying equipment.

The helminthiases

Dr Paul C. Beaver has been appointed WHO consultant to review the general problems of the helminthiases other than bilharziasis and filariasis and to assist WHO in outlining the general principles for a programme of research and control, with special reference to the common intestinal worms associated with inadequate sanitation—ascaris, trichuris, and the hookworms.

Dr Beaver is Professor of Tropical Diseases and Hygiene and Head of the Division of Parasitology in the Department of Tropical Medicine and Public Health, Tulane University, New Orleans, Louisiana, USA. He studied parasitology at the University of Illinois, and has been in charge of malaria and hookworm control in the Georgia Department of Public Health.

Research in bilharziasis

Dr Nelson G. Hairston, Associate Professor of Zoology at the University of Michigan, Ann Arbor, Michigan, USA, has been appointed WHO consultant to the Organization's research programme on bilharziasis. He will be primarily concerned with sampling techniques for the aquatic and amphibious vectors of the disease, and with the preparation of forms and records for use in pilot experiments in the field.

Dr Hairston studied at the University of North Carolina and at Northwestern University. While on military duty in Leyte, Philippines, in 1945, he took part in research on bilharziasis, and from 1954 to 1956 he was adviser in medical zoology to the Philippines Bilharziasis Project at Palo, Leyte. He has been a WHO consultant in Iraq and at Geneva, and in 1959 helped evaluate the work of the Philippines Project. He has been a member of the faculty of the University of Michigan since 1948.

CORRIGENDUM

Vol. 14, No. 1

Page 9, map of distribution of leprosy

The map on this page may give the impression that there are indigenous foci of leprosy in the south of France. In fact, there are only isolated or imported cases, as is clear from the text.

Monograph Series No. 44

ENDEMIC GOITRE

Preface — *P. Langer*: History of goitre — *F. C. Kelly & W. W. Snedden*: Prevalence and geographical distribution of endemic goitre — *F. W. Clements*: Health significance of endemic goitre and related conditions — *J. B. Stanbury*: Physiology of endemic goitre — *S. T. Milcu*: The study of experimental goitre — *M. P. De Smet*: Pathological anatomy of endemic goitre — *J. Roche & S. Lissitzky*: Etiology of endemic goitre — *C. Pérez, N. S. Scrimshaw & J. A. Muñoz*: Technique of endemic goitre surveys — *J. Matovinović & V. Ramalingaswami*: Therapy and prophylaxis of endemic goitre — *J. C. M. Holman & W. McCartney*: Iodization of salt — *F. W. Lowenstein*: Principles and problems of endemic goitre control — *J. De Moerloose*: Legislation on iodine prophylaxis

1960; 472 pages **£2 $8.00** Sw. fr. **24.**— (clothbound)

WORLD HEALTH ORGANIZATION